

FEDERAL AID PROJECT NO.			
BR 2024(354), ETC			
CONT	SECT	JOB	HIGHWAY
0923	17	090, ETC	CR 260, ETC
DIST	COUNTY		SHEET NO.
BWD	COMANCHE, ETC		1

DESIGN SPEED = MEETS OR EXCEEDS EXISTING  
 A.D.T. (2013) = 50  
 A.D.T. (2033) = 70

**FINAL PLANS**

LETTING DATE: \_\_\_\_\_  
 DATE CONTRACTOR BEGAN WORK: \_\_\_\_\_  
 DATE WORK WAS COMPLETED & ACCEPTED: \_\_\_\_\_  
 FINAL CONTRACT COST: \$ \_\_\_\_\_  
 CONTRACTOR: \_\_\_\_\_

REQUIRED SIGNS SHALL BE IN ACCORDANCE WITH BC (1)- 21 THRU BC (12)- 21 AND THE "TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES".

**STATE OF TEXAS  
 DEPARTMENT OF TRANSPORTATION**

**PLANS OF PROPOSED  
 STATE HIGHWAY IMPROVEMENT**

FEDERAL PROJECT: BR 2023 (226)  
 CSJ: 0923-17-084

**CR 392  
 COMANCHE COUNTY**

FOR THE CONSTRUCTION OF BRIDGE REPLACEMENT  
 CONSISTING OF REPLACING BRIDGE AND APPROACHES

LIMITS: AT RESLEY CREEK

NET LENGTH OF ROADWAY = 300 FT. = 0.057 MI.  
 NET LENGTH OF BRIDGE = 125 FT. = 0.024 MI.  
 NET LENGTH OF PROJECT = 425 FT. = 0.081 MI.

**INDEX OF SHEETS**

SEE SHEET 2 FOR INDEX OF SHEETS

FINAL PLANS STATEMENT

THE CONSTRUCTION WORK WAS PERFORMED IN ACCORDANCE WITH THE PLANS.

THIS AREA IS RESERVED FOR THE PE'S SEAL

\_\_\_\_\_  
 P.E.  
 AREA ENGINEER

\_\_\_\_\_  
 DATE

TEXAS DEPARTMENT OF TRANSPORTATION

**VOLUME 3**  
 CONTRACT CSJ:0923-17-090



BEGIN PROJECT  
 STA 9+57.00  
 CSJ: 0923-17-084

END PROJECT  
 STA 13+82.00  
 CSJ: 0923-17-084

EXCEPTIONS: NONE  
 EQUATIONS: NONE  
 RAILROAD CROSSING: NONE

NOT TO SCALE



TBPE REG. NO. F-2742

SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION, NOVEMBER 1, 2014 AND SPECIFICATION ITEMS LISTED AND DATED AS FOLLOWS, SHALL GOVERN ON THIS PROJECT: REQUIRED CONTRACT PROVISIONS FOR ALL FEDERAL-AID CONSTRUCTION CONTRACTS (FORM FHWA 1273, OCTOBER 2023)

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COUNTY COMANCHE PROJ. NO. BR 2023(226)  
 HWY. NO. CR 392 LETTING DATE \_\_\_\_\_  
 DATE ACCEPTED \_\_\_\_\_

CONCURRENCE: 12/27/2023

DocuSigned by:  
*Stephanie Davis*  
 5B0490540F63477...  
 COUNTY JUDGE



SUBMITTED FOR LETTING: 1/3/2024

DocuSigned by:  
*MA SUT, P.E.*  
 77D14777834646F...  
 DISTRICT DESIGN ENGINEER

RECOMMENDED FOR LETTING: 1/3/2024

DocuSigned by:  
*MA SUT, P.E.*  
 77D14777834646F...  
 DISTRICT DIRECTOR OF TRANSPORTATION  
 PLANNING AND DEVELOPMENT

RECOMMENDED FOR LETTING: 1/3/2024

DocuSigned by:  
*Gregory W. Cedillo, P.E.*  
 58E2D01C26B3405...  
 DISTRICT ENGINEER

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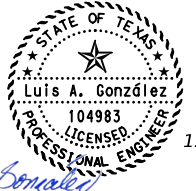
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THE STANDARD SHEETS SPECIFICALLY IDENTIFIED ON THIS SHEET WITH A "\*" OR "#" HAVE BEEN SELECTED BY ME OR UNDER MY RESPONSIBLE SUPERVISION AS BEING APPLICABLE TO THIS PROJECT.

*Luis A. Gonzalez*, PE 12/19/2023  
 LUIS A. GONZALEZ DATE




*Luis A. Gonzalez*

NO.	DATE	REVISION	APPROV.



**Texas Department of Transportation**



TBPE REG. NO. F-2742

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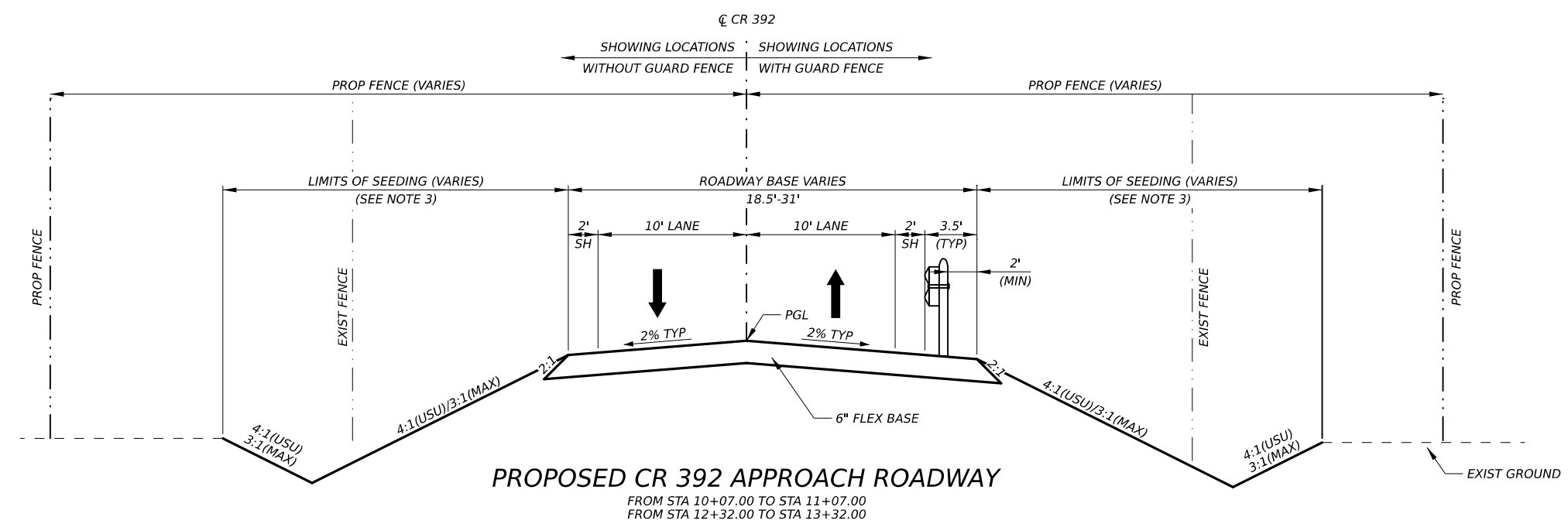
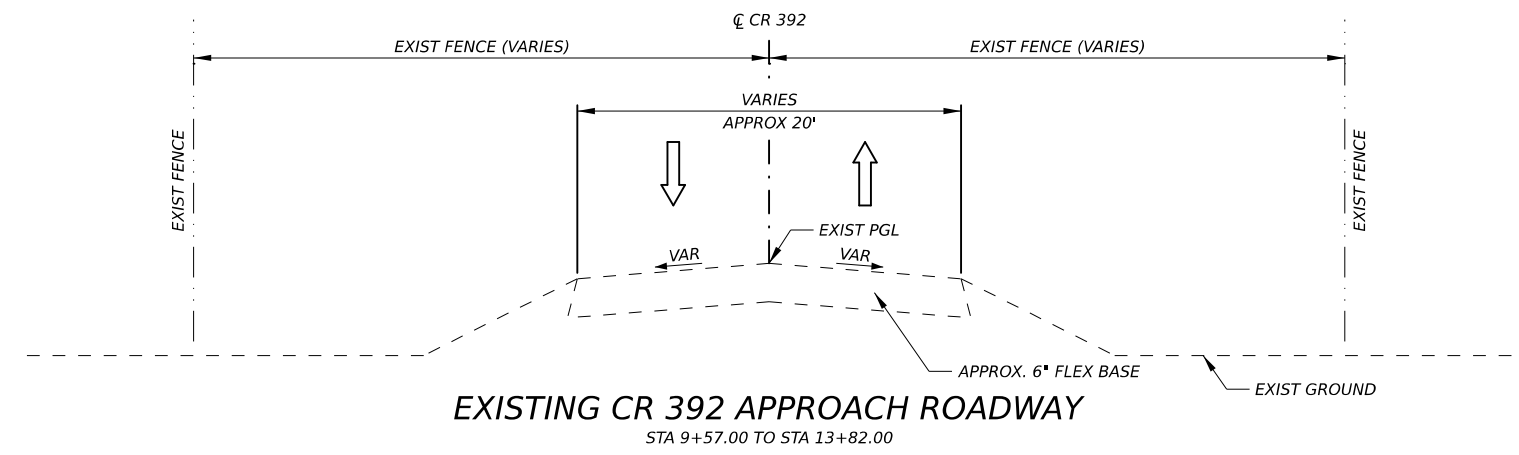
CR 392 @ RESLEY CREEK

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 OF SHEETS

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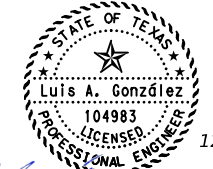
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PROPOSED BRIDGE FROM STA 11+07.00 TO STA 12+32.00  
 TRANSITION FROM EXISTING WIDTH TO PROPOSED WIDTH  
 STA 9+57.00 TO STA 10+07.00 (SEE NOTE 1)  
 STA 13+32.00 TO STA 13+82.00 (SEE NOTE 2)

- NOTES:
- 1.) TRANSITION FROM EXISTING CROSS-SLOPE AT STA 9+57.00 TO 2% CROSS-SLOPE AT STA 10+07.00
  - 2.) TRANSITION FROM 2% CROSS-SLOPE AT STA 13+32.00 TO EXISTING CROSS-SLOPE AT STA 13+82.00
  - 3.) SEE ROADWAY PLAN & PROFILE SHEETS FOR LOCATIONS OF DITCH SECTIONS

NOT TO SCALE



*Luis A. González*

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CR 392 @ RESLEY CREEK

TYPICAL SECTIONS

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0923	17	084	CR 392
DIST	COUNTY	SHEET NO.	
BWD	COMANCHE	3	

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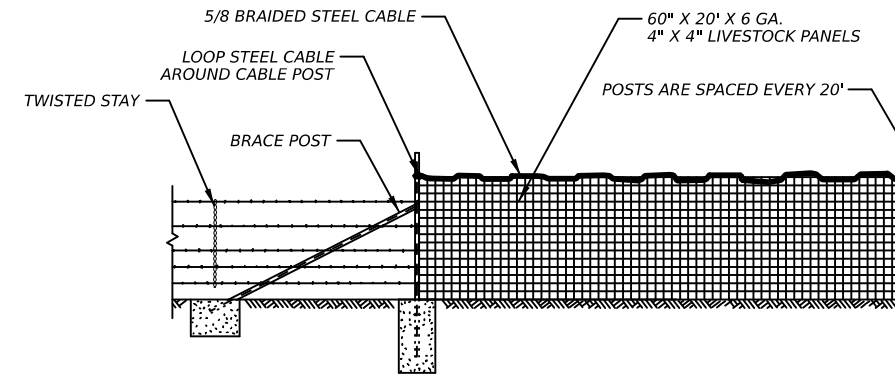
### SUMMARY OF ROADWAY QUANTITIES

		100	247	530	540	540	544	658	658
		6002	6055	6016	6002	6007	6001	6014	6062
STATION TO STATION		① PREPARING ROW	FL BS (CMP IN PLC)(TY D GR 3)(FNAL POS)	DRIVEWAYS (BASE)	MTL W-BEAM GD FEN (STEEL POST)	MTL BEAM GD FEN TRANS (TL2)	GUARDRAIL END TREATMENT (INSTALL)	INSTL DEL ASSM (D-SW)SZ (BRF)CTB (BI)	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)
CSJ: 0923-17-084		STA	CY	SY	LF	EA	EA	EA	EA
FROM	TO								
9+57.00	10+02.00	0.45	22	33					
10+02.00	11+07.00	1.05	61		50	2	2		
11+07.00	12+32.00	1.25							
12+32.00	13+37.00	1.05	61		50	2	2		
13+37.00	13+82.00	0.45	24						
<b>TOTALS:</b>		<b>4.25</b>	<b>168</b>	<b>33</b>	<b>100</b>	<b>4</b>	<b>4</b>	<b>6</b>	<b>8</b>

### SUMMARY OF EARTHWORK QUANTITIES

ITEM	110	110	132	132
DESCRIPTION	6001	6002	6005	6005
LOCATION	EXCAVATION (ROADWAY)	EXCAVATION (CHANNEL)	② EMBANKMENT (FINAL)(ORD COMP)(TY C)	③ EMBANKMENT (FINAL)(ORD COMP)(TY C)
CSJ:0923-17-084	CY	CY	CY	CY
9+57.00 R1	0		0	
9+75.00 R1	8		0	
10+00.00 R1	13		3	
10+25.00 R1	14		6	
10+50.00 R1	20		17	
10+75.00 R1	21		15	
11+00.00 R1	17		17	
11+25.00 R1	10		8	
11+50.00 R1	5		0	
11+75.00 R1	0		0	
12+00.00 R1	0	3930	0	58
12+25.00 R1	5		0	
12+50.00 R1	10		3	
12+75.00 R1	10		7	
13+00.00 R1	11		6	
13+25.00 R1	11		3	
13+50.00 R1	11		2	
13+75.00 R1	11		1	
13+82.00 R1	3		0	
<b>TOTALS:</b>	<b>180</b>	<b>3930</b>	<b>88</b>	<b>58</b>

NOTE: REMOVAL OF EXISTING PAVEMENT STRUCTURE INCLUDED WITHIN EXCAVATION QUANTITY. VOLUME OF BACKFILL VOID LEFT FROM REMOVAL OF EXISTING PAVEMENT STRUCTURE INCLUDED WITHIN EMBANKMENT QUANTITY.



**WATER GAP DETAIL**  
NOT TO SCALE

- ① BRUSH REMOVAL AND TREE REMOVAL REQUIRED FOR CLEARING AREAS WITHIN THE GRADING LIMITS OF THE PROJECT ARE CONSIDERED SUBSIDIARY TO BID ITEM 100 "PREPARING ROW".
- ② EMBANKMENT FOR ROADWAY
- ③ EMBANKMENT FOR CHANNEL GRADING
- ④ PLACE WIRE FENCE AS DIRECTED BY THE ENGINEER. WIRE FENCE (TY A) IS TO BE USED FOR TEMPORARY FENCE AND QUANTITIES ARE APPROXIMATE AND MAY BE ADJUSTED. WILL REQUIRE APPROXIMATELY 4 CORNERS.

### SUMMARY OF REMOVAL QUANTITIES

		496
		6009
STATION TO STATION		REMOV STR (BRIDGE 0 - 99 FT LENGTH)
CSJ: 0923-17-084		EA
FROM	TO	
9+57.00	13+82.00	1
<b>TOTALS:</b>		<b>1</b>

### SUMMARY OF FENCE QUANTITIES

		552	552	552	552
		6001	6003	6006	6008
STATION TO STATION		④ WIRE FENCE (TY A)	WIRE FENCE (TY C)	GATE (TY 2)	WIRE FENCE (WATER GAP)
CSJ: 0923-17-084		LF	LF	EA	LF
FROM	TO				
9+57.00	13+82.00	400	631	2	125
<b>TOTALS:</b>		<b>400</b>	<b>631</b>	<b>2 *</b>	<b>125</b>

\* EACH GATE SHALL BE 10 FT LENGTH

### SUMMARY OF SWP3 QUANTITIES

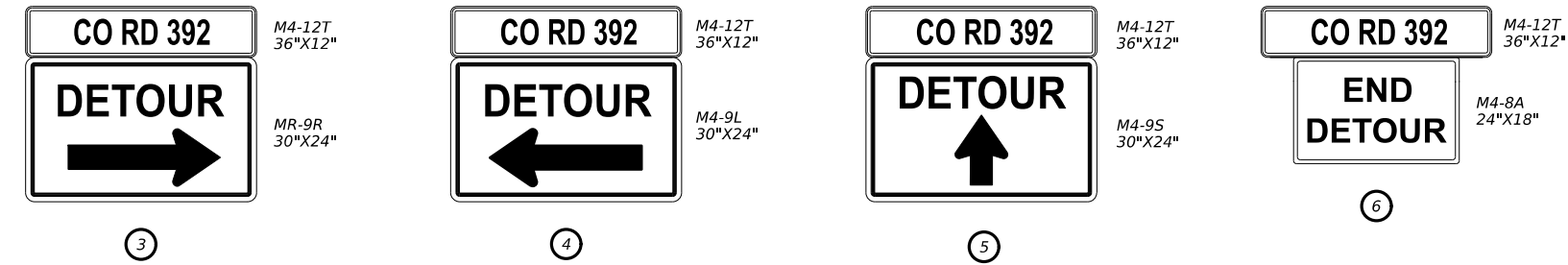
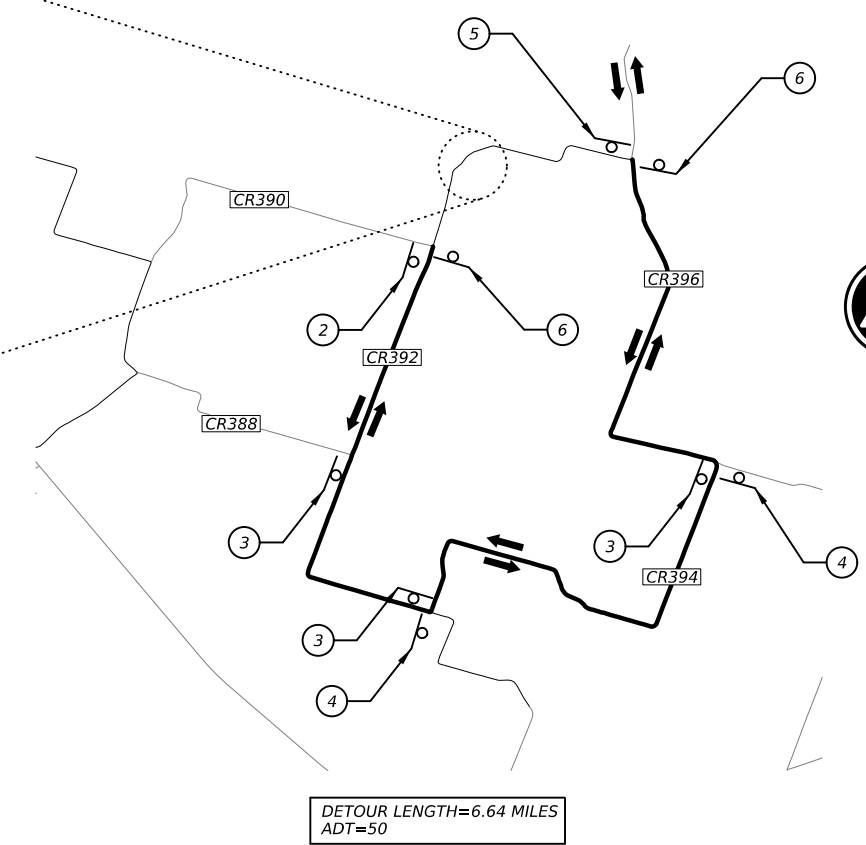
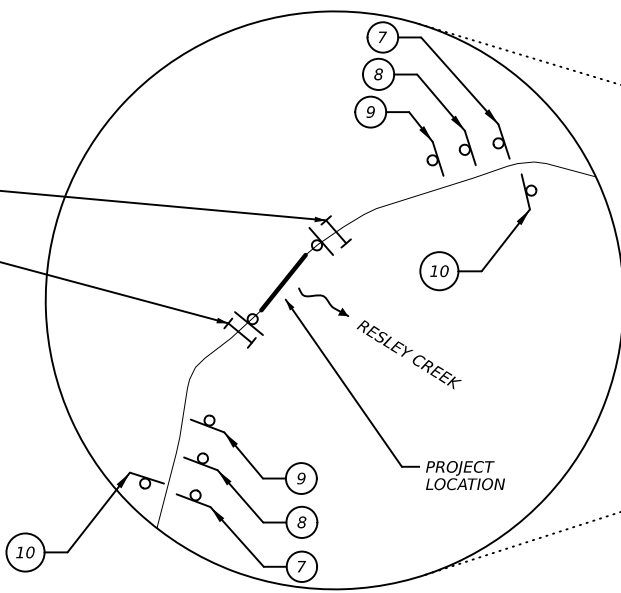
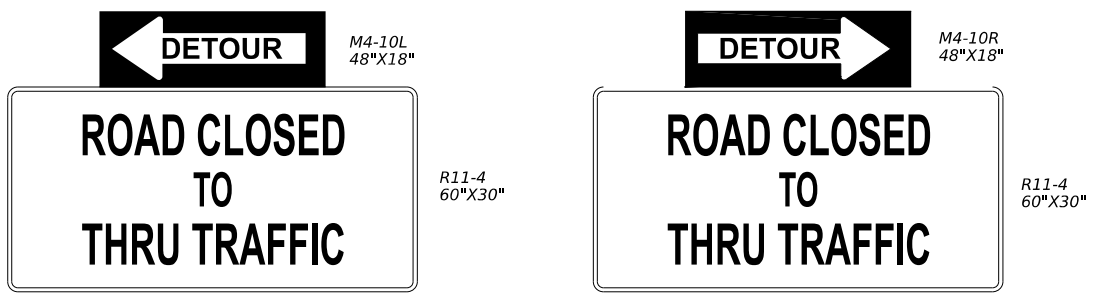
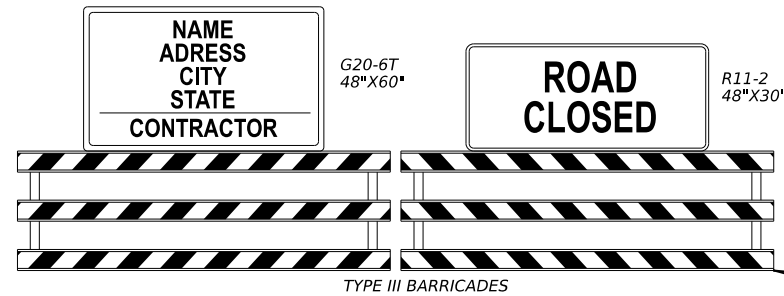
		164	164	164	168	169	169	506	506	506	506
		6001	6009	6011	6001	6004	6007	6038	6039	6042	6043
STATION TO STATION		BROADCAST SEED (PERM) (RURAL) (SANDY)	BROADCAST SEED (TEMP) (WARM)	BROADCAST SEED (TEMP) (COOL)	VEGETATIVE WATERING	SOIL RETENTION BLANKETS (CL 1) (TY D)	SOIL RETENTION BLANKETS (CL 2) (TY G)	TEMP SEDMT CONT FENCE (INSTALL)	TEMP SEDMT CONT FENCE (REMOVE)	BIODEG EROSN CONT LOGS (INSTL) (18")	BIODEG EROSN CONT LOGS (REMOVE)
CSJ: 0923-17-084		SY	SY	SY	MG	SY	SY	LF	LF	LF	LF
FROM	TO										
9+57.00	13+82.00	2387	1194	1194	38.48	2219	125	753	753	611	611
<b>TOTALS:</b>		<b>2387</b>	<b>1194</b>	<b>1194</b>	<b>38</b>	<b>2219</b>	<b>125</b>	<b>753</b>	<b>753</b>	<b>611</b>	<b>611</b>

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<b>CR 392 @ RESLEY CREEK</b>							
QUANTITY SUMMARIES							
SHEET 1 OF 1							
CONT	SECT	JOB	HIGHWAY				
0923	17	084	CR 392				
DIST	COUNTY	SHEET NO.					
BWD	COMANCHE	4					

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**LEGEND**

- PROPOSED DIRECTION OF TRAFFIC
- TYPE III BARRICADE
- GROUND MOUNTED SIGN
- DRAINAGE FLOW DIRECTION



**GENERAL NOTES**

CONTRACTOR SHALL PLACE SIGNS IN ACCORDANCE WITH THE BARRICADE AND CONSTRUCTION STANDARDS OR AS DIRECTED BY THE ENGINEER.

OTHER SIGNS AS DETAILED IN THE BARRICADE AND CONSTRUCTION STANDARDS AND IN THE TMUTCD MAY BE USED AS REQUIRED BY THE ENGINEER IN ORDER TO PROVIDE FOR THE SAFE PASSAGE OF TRAFFIC THROUGH THE PROJECT. PAYMENT FOR ALL SUCH SIGNS, BARRICADES OR TRAFFIC CONTROL DEVICES SHALL BE CONSIDERED SUBSIDIARY TO ITEM 502 \*BARRICADES, SIGNS AND TRAFFIC HANDLING\*.

CONTRACTOR SHALL PROVIDE ACCESS TO AND FROM DRIVEWAYS AND ALL ADJACENT PROPERTY AT ALL TIMES.

**TRAFFIC CONTROL SEQUENCE**

THE CONTRACTOR SHALL BE REQUIRED TO SUBMIT A DETAILED SCHEDULE OF WORK TO THE AREA ENGINEER PRIOR TO THE BEGINNING OF CONSTRUCTION, WHICH GENERALLY CONFORMS TO THE FOLLOWING SEQUENCE:

1. INSTALL PROJECT LIMIT SIGNING AND BARRICADES AND SW3P PRIOR TO BEGINNING ANY OTHER WORK.
2. ALL ROAD CLOSURE SIGNING SHALL BE IN PLACE PRIOR TO ANY ACTIVITIES WHICH WILL PROHIBIT THROUGH TRAFFIC AND SHALL BE PLACED MORE THAN 24 HOURS PRIOR TO SUCH ACTIVITY.
3. COMPLETE THE CONSTRUCTION OF THE BRIDGE AND APPROACHES ACCORDING TO THE PLANS AND SPECIFICATIONS AND AS DIRECTED BY THE ENGINEER.
4. THE ROADWAY SHALL BE OPEN TO THROUGH TRAFFIC AS SOON AS DETERMINED PRACTICAL BY THE ENGINEER.
5. COMPLETE ALL OTHER WORK AS DIRECTED BY THE ENGINEER.

NOT TO SCALE

STATE OF TEXAS  
Luis A. González  
104983  
LICENSED PROFESSIONAL ENGINEER  
12/19/2023

*Luis A. Gonzalez*

NO.	DATE	REVISION	APPROV.



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TBPE REG. NO. F-2742

CR 392 @ RESLEY CREEK

**TRAFFIC CONTROL PLAN**

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0923	17	084	CR 392
DIST	COUNTY	SHEET NO.	
BWD	COMANCHE	5	

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**BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:**

- The Barricade and Construction Standard Sheets (BC sheets) are intended to show typical examples for placement of temporary traffic control devices, construction pavement markings, and typical work zone signs. The information contained in these sheets meet or exceed the requirements shown in the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
- The development and design of the Traffic Control Plan (TCP) is the responsibility of the Engineer.
- The Contractor may propose changes to the TCP that are signed and sealed by a licensed professional engineer for approval. The Engineer may develop, sign and seal Contractor proposed changes.
- The Contractor is responsible for installing and maintaining the traffic control devices as shown in the plans. The Contractor may not move or change the approximate location of any device without the approval of the Engineer.
- Geometric design of lane shifts and detours should, when possible, meet the applicable design criteria contained in manuals such as the American Association of State Highway and Transportation Officials (AASHTO), "A Policy on Geometric Design of Highways and Streets," the TxDOT "Roadway Design Manual" or engineering judgment.
- When projects abut, the Engineer(s) may omit the END ROAD WORK, TRAFFIC FINES DOUBLE, and other advance warning signs if the signing would be redundant and the work areas appear continuous to the motorists. If the adjacent project is completed first, the Contractor shall erect the necessary warning signs as shown on these sheets, the TCP sheets or as directed by the Engineer. The BEGIN ROAD WORK NEXT X MILES sign shall be revised to show appropriate work zone distance.
- The Engineer may require duplicate warning signs on the median side of divided highways where median width will permit and traffic volumes justify the signing.
- All signs shall be constructed in accordance with the details found in the "Standard Highway Sign Designs for Texas," latest edition. Sign details not shown in this manual shall be shown in the plans or the Engineer shall provide a detail to the Contractor before the sign is manufactured.
- The temporary traffic control devices shown in the illustrations of the BC sheets are examples. As necessary, the Engineer will determine the most appropriate traffic control devices to be used.
- Where highway construction or maintenance work is being undertaken, other than mobile operations as defined by the Texas Manual on Uniform Traffic Control Devices, CSJ limit signs are required. CSJ limit signs are shown on BC(2). The OBEY WARNING SIGNS STATE LAW sign, STAY ALERT TALK OR TEXT LATER and the WORK ZONE TRAFFIC FINES DOUBLE sign with plaque shall be erected in advance of the CSJ limits. The BEGIN ROAD WORK NEXT X MILES, CONTRACTOR and END ROAD WORK signs shall be erected at or near the CSJ limits. For mobile operations, CSJ limit signs are not required.
- Traffic control devices should be in place only while work is actually in progress or a definite need exists.
- The Engineer has the final decision on the location of all traffic control devices.
- Inactive equipment and work vehicles, including workers' private vehicles must be parked away from travel lanes. They should be as close to the right-of-way line as possible, or located behind a barrier or guardrail, or as approved by the Engineer.

**WORKER SAFETY NOTES:**


- Workers on foot who are exposed to traffic or to construction equipment within the right-of-way shall wear high-visibility safety apparel meeting the requirements of ISEA "American National Standard for High-Visibility Apparel," or equivalent revisions, and labeled as ANSI 107-2004 standard performance for Class 2 or 3 risk exposure. Class 3 garments should be considered for high traffic volume work areas or night time work.
- Except in emergency situations, flagger stations shall be illuminated when flagging is used at night.

**COMPLIANT WORKZONE TRAFFIC CONTROL DEVICES**

- Only pre-qualified products shall be used. The "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources.
- Work zone traffic control devices shall be compliant with the Manual for Assessing safety Hardware (MASH).

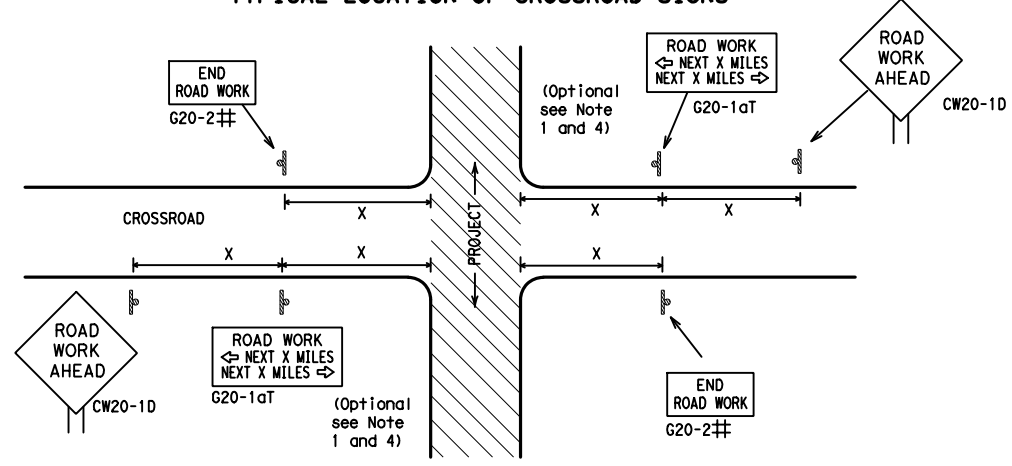
<b>THE DOCUMENTS BELOW CAN BE FOUND ON-LINE AT</b> <a href="http://www.txdot.gov">http://www.txdot.gov</a>
COMPLIANT WORK ZONE TRAFFIC CONTROL DEVICES LIST (CWZTCD)
DEPARTMENTAL MATERIAL SPECIFICATIONS (DMS)
MATERIAL PRODUCER LIST (MPL)
ROADWAY DESIGN MANUAL - SEE "MANUALS (ONLINE MANUALS) "
STANDARD HIGHWAY SIGN DESIGNS FOR TEXAS (SHSD)
TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (TMUTCD)
TRAFFIC ENGINEERING STANDARD SHEETS

SHEET 1 OF 12

 Texas Department of Transportation		Traffic Safety Division Standard	
<b>BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS</b>			
<b>BC (1) -21</b>			
FILE:	bc-21.dgn	DN:	TxDOT
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		DW:	TxDOT
		CR:	TxDOT
REVISIONS		CONT	SECT
4-03	7-13	0923	17
9-07	8-14		084
5-10	5-21		CR 392
		DIST	COUNTY
		BWD	COMANCHE
			SHEET NO.
			6

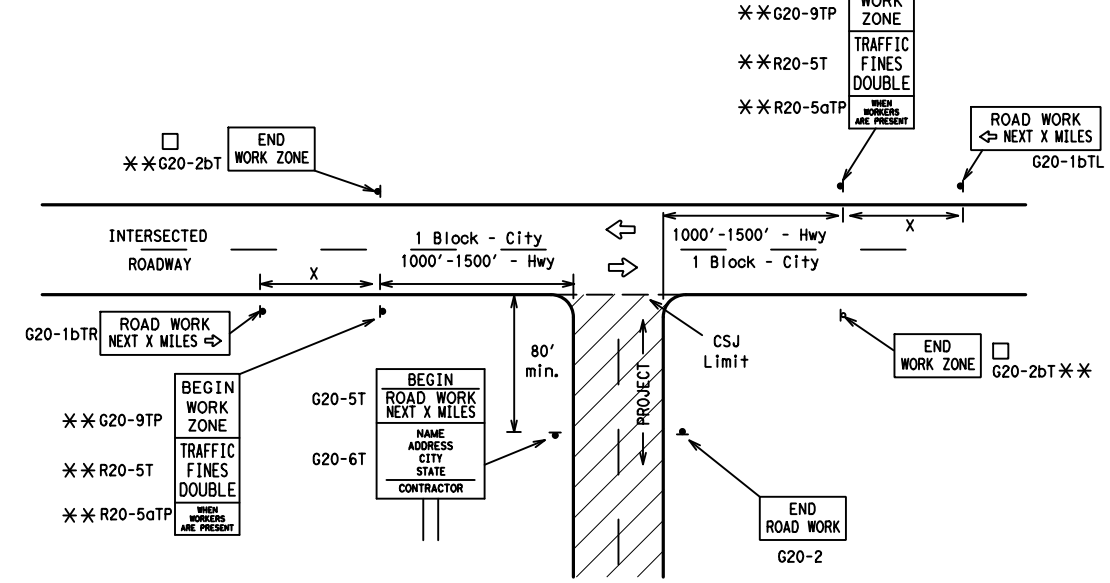
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**TYPICAL LOCATION OF CROSSROAD SIGNS**



- ## May be mounted on back of "ROAD WORK AHEAD" (CW20-1D) sign with approval of Engineer. (See note 2 below)
- The typical minimum signing on a crossroad approach should be a "ROAD WORK AHEAD" (CW20-1D) sign and a (G20-2) "END ROAD WORK" sign, unless noted otherwise in plans.
  - The Engineer may use the reduced size 36" x 36" ROAD WORK AHEAD (CW20-1D) sign mounted back to back with the reduced size 36" x 18" "END ROAD WORK" (G20-2) sign on low volume crossroads (see Note 4 under "Typical Construction Warning Sign Size and Spacing"). See the "Standard Highway Sign Designs for Texas" manual for sign details. The Engineer may omit the advance warning signs on low volume crossroads. The Engineer will determine whether a road is low volume as per TMUTCD Part 5. This information shall be shown in the plans.
  - Based on existing field conditions, the Engineer/Inspector may require additional signs such as FLAGGER AHEAD, LOOSE GRAVEL, or other appropriate signs. When additional signs are required, these signs will be considered part of the minimum requirements. The Engineer/Inspector will determine the proper location and spacing of any sign not shown on the BC sheets, Traffic Control Plan sheets or the Work Zone Standard Sheets.
  - The "ROAD WORK NEXT X MILES" (G20-1aT) sign shall be required at high volume crossroads to advise motorists of the length of construction in either direction from the intersection. The Engineer will determine whether a roadway is considered high volume.
  - Additional traffic control devices may be shown elsewhere in the plans for higher volume crossroads.
  - When work occurs in the intersection area, appropriate traffic control devices, as shown elsewhere in the plans or as determined by the Engineer/Inspector, shall be in place.

**T-INTERSECTION**



**CSJ LIMITS AT T-INTERSECTION**

- The Engineer will determine the types and location of any additional traffic control devices, such as a flagger and accompanying signs, or other signs, that should be used when work is being performed at or near an intersection.
- If construction closes the road at a T-intersection, the Contractor shall place the "CONTRACTOR NAME" (G20-6T) sign behind the Type 3 Barricades for the road closure (see BC(10) also). The "ROAD WORK NEXT X MILES" left arrow (G20-1bTL) and "ROAD WORK NEXT X MILES" right arrow (G20-1bTR) signs shall be replaced by the detour signing called for in the plans.

**TYPICAL CONSTRUCTION WARNING SIGN SIZE AND SPACING<sup>1,5,6</sup>**

Sign Number or Series	SIZE		SPACING	
	Conventional Road	Expressway/Freeway	Posted Speed MPH	Sign Δ Spacing "X" Feet (Apprx.)
CW20 <sup>4</sup>	48" x 48"	48" x 48"	30	120
CW21			35	160
CW22			40	240
CW23			45	320
CW25			50	400
CW1, CW2, CW7, CW8, CW9, CW11, CW14	48" x 48"	48" x 48"	55	500 <sup>2</sup>
			60	600 <sup>2</sup>
			65	700 <sup>2</sup>
			70	800 <sup>2</sup>
			75	900 <sup>2</sup>
CW3, CW4, CW5, CW6, CW8-3, CW10, CW12	48" x 48"	48" x 48"	80	1000 <sup>2</sup>
			*	*
			*	*

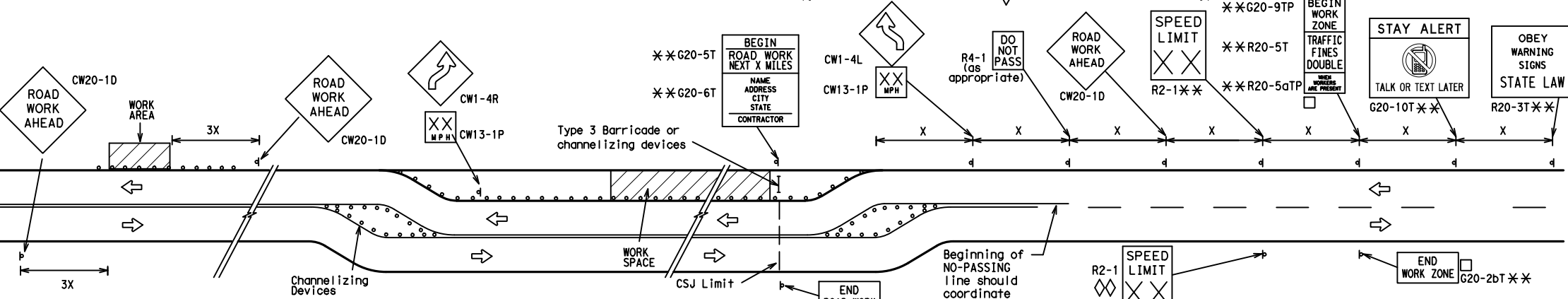
\* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

Δ Minimum distance from work area to first Advance Warning sign nearest the work area and/or distance between each additional sign.

**GENERAL NOTES**

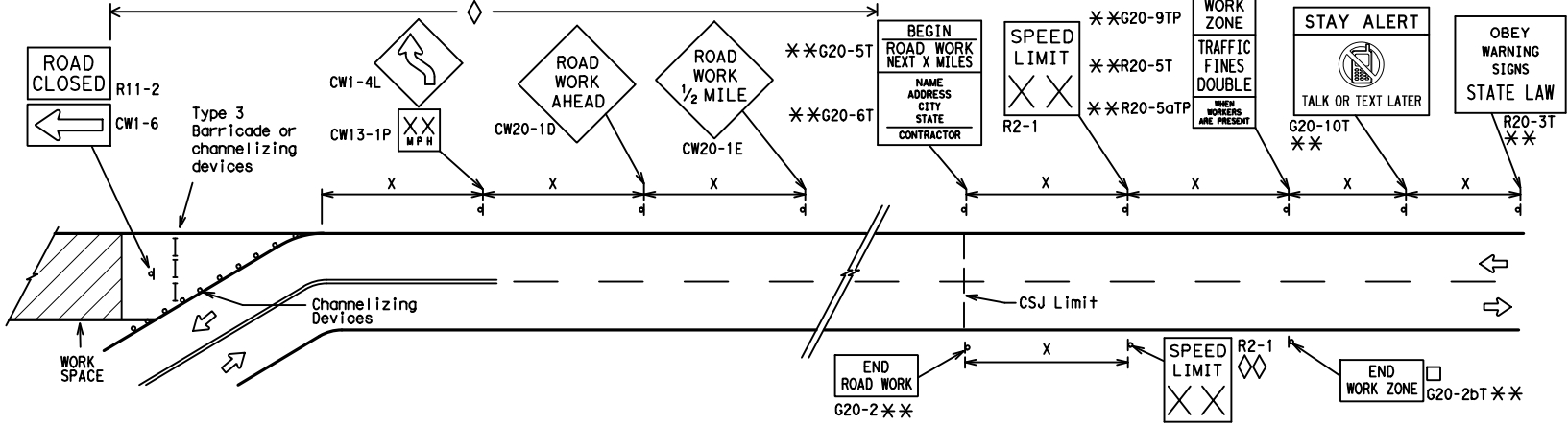
- Special or larger size signs may be used as necessary.
- Distance between signs should be increased as required to have 1500 feet advance warning.
- Distance between signs should be increased as required to have 1/2 mile or more advance warning.
- 36" x 36" "ROAD WORK AHEAD" (CW20-1D) signs may be used on low volume crossroads at the discretion of the Engineer as per TMUTCD Part 5. See Note 2 under "Typical Location of Crossroad Signs".
- Only diamond shaped warning sign sizes are indicated.
- See sign size listing in "TMUTCD", Sign Appendix or the "Standard Highway Sign Designs for Texas" manual for complete list of available sign design sizes.

**WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS**



When extended distances occur between minimal work spaces, the Engineer/Inspector should ensure additional "ROAD WORK AHEAD" (CW20-1D) signs are placed in advance of these work areas to remind drivers they are still within the project limits. See the applicable TCP sheets for exact location and spacing of signs and channelizing devices.

**SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING DOWNSTREAM OF THE CSJ LIMITS**



**NOTES**

- The Contractor shall determine the appropriate distance to be placed on the G20-1 series signs and "BEGIN ROAD WORK NEXT X MILES" (G20-5T) sign for each specific project. This distance shall replace the "X" and shall be rounded to the nearest whole mile with the approval of the Engineer. No decimals shall be used.
- The "BEGIN WORK ZONE" (G20-9TP) and "END WORK ZONE" (G20-2bT) shall be used as shown on the sample layout when advance signs are required outside the CSJ Limits. They inform the motorist of entering or leaving a part of the work zone lying outside the CSJ Limits where traffic fines may double if workers are present.
  - CSJ limit signing is required for highway construction and maintenance work, with the exception of mobile operations.
  - Area for placement of "ROAD WORK AHEAD" (CW20-1D) sign and other signs or devices as called for on the Traffic Control Plan.
  - Contractor will install a regulatory speed limit sign at the end of the work zone.

**LEGEND**

—	Type 3 Barricade
○ ○ ○	Channelizing Devices
■	Sign
X	See Typical Construction Warning Sign Size and Spacing chart or the TMUTCD for sign spacing requirements.

SHEET 2 OF 12



**BARRICADE AND CONSTRUCTION PROJECT LIMIT**

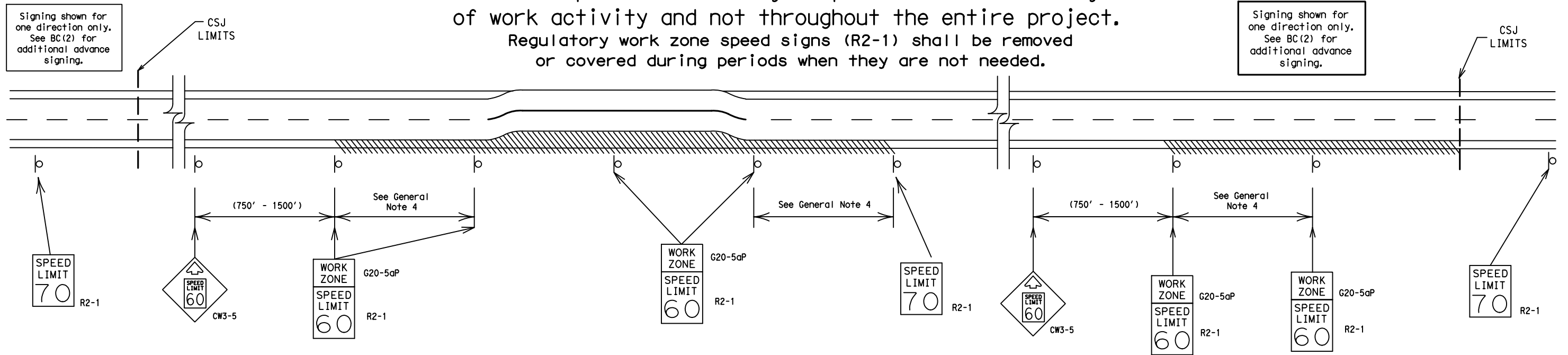
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# TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

Work zone speed limits shall be regulatory, established in accordance with the "Procedures for Establishing Speed Zones," and approved by the Texas Transportation Commission, or by City Ordinance when within Incorporated City Limits.

Reduced speeds should only be posted in the vicinity of work activity and not throughout the entire project. Regulatory work zone speed signs (R2-1) shall be removed or covered during periods when they are not needed.



## GUIDANCE FOR USE:

### LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

This type of work zone speed limit should be included on the design of the traffic control plans when restricted geometrics with a lower design speed are present in the work zone and modification of the geometrics to a higher design speed is not feasible.

Long/Intermediate Term Work Zone Speed Limit signs, when approved as described above, should be posted and visible to the motorist when work activity is present. Work activity may also be defined as a change in the roadway that requires a reduced speed for motorists to safely negotiate the work area, including:

- rough road or damaged pavement surface
- substantial alteration of roadway geometrics (diversions)
- construction detours
- grade
- width
- other conditions readily apparent to the driver

As long as any of these conditions exist, the work zone speed limit signs should remain in place.

### SHORT TERM WORK ZONE SPEED LIMITS

This type of work zone speed limit may be included on the design of the traffic control plans when workers or equipment are not behind concrete barrier, when work activity is within 10 feet of the traveled way or actually in the traveled way.

Short Term Work Zone Speed Limit signs should be posted and visible to the motorists only when work activity is present. When work activity is not present, signs shall be removed or covered. (See Removing or Covering on BC(4)).

## GENERAL NOTES

- Regulatory work zone speed limits should be used only for sections of construction projects where speed control is of major importance.
- Regulatory work zone speed limit signs shall be placed on supports at a 7 foot minimum mounting height.
- Speed zone signs are illustrated for one direction of travel and are normally posted for each direction of travel.
- Frequency of work zone speed limit signs should be:
 

40 mph and greater	0.2 to 2 miles
35 mph and less	0.2 to 1 mile
- Regulatory speed limit signs shall have black legend and border on a white reflective background (See "Reflective Sheeting" on BC(4)).
- Fabrication, erection and maintenance of the "ADVANCE SPEED LIMIT" (CW3-5) sign, "WORK ZONE" (G20-5aP) plaque and the "SPEED LIMIT" (R2-1) signs shall not be paid for directly, but shall be considered subsidiary to Item 502.
- Turning signs from view, laying signs over or down will not be allowed, unless as otherwise noted under "REMOVING OR COVERING" on BC(4).
- Techniques that may help reduce traffic speeds include but are not limited to:
  - Law enforcement.
  - Flagger stationed next to sign.
  - Portable changeable message sign (PCMS).
  - Low-power (drone) radar transmitter.
  - Speed monitor trailers or signs.
- Speeds shown on details above are for illustration only. Work Zone Speed Limits should only be posted as approved for each project.
- For more specific guidance concerning the type of work, work zone conditions and factors impacting allowable regulatory construction speed zone reduction see TxDOT form #1204 in the TxDOT e-form system.

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SHEET 3 OF 12



## BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

### BC(3)-21

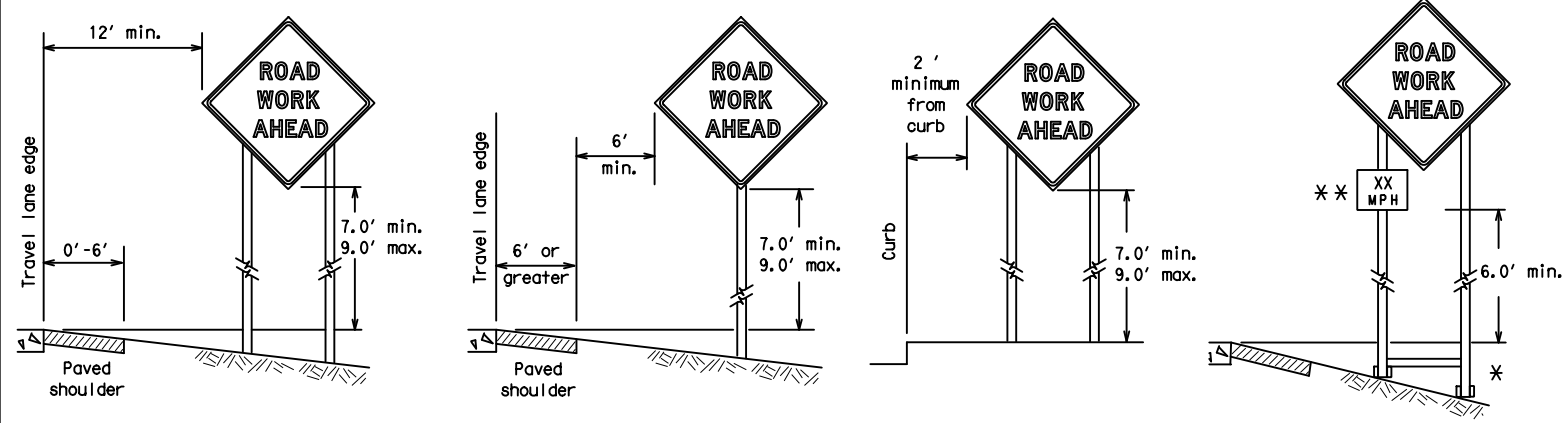
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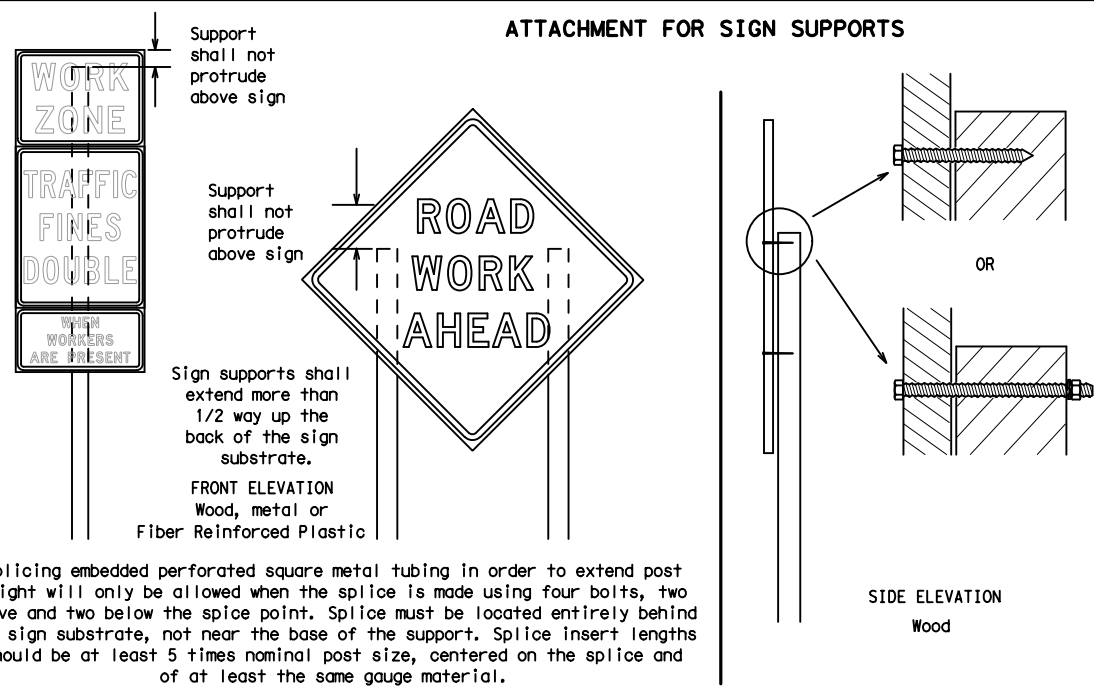
**TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS**



\* When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

\*\* When plaques are placed on dual-leg supports, they should be attached to the upright nearest the travel lane. Supplemental plaques (advisory or distance) should not cover the surface of the parent sign.

**ATTACHMENT FOR SIGN SUPPORTS**



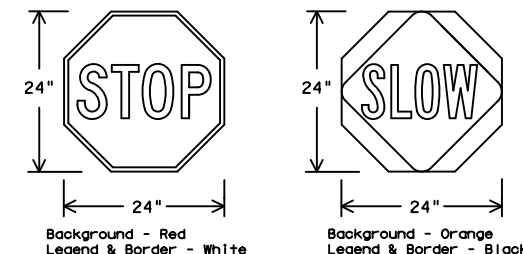
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

**Nails shall NOT be allowed.**  
 Each sign shall be attached directly to the sign support. Multiple signs shall not be joined or spliced by any means. Wood supports shall not be extended or repaired by splicing or other means.

Splicing embedded perforated square metal tubing in order to extend post height will only be allowed when the splice is made using four bolts, two above and two below the splice point. Splice must be located entirely behind the sign substrate, not near the base of the support. Splice insert lengths should be at least 5 times nominal post size, centered on the splice and of at least the same gauge material.

**STOP/SLOW PADDLES**

1. STOP/SLOW paddles are the primary method to control traffic by flaggers. The STOP/SLOW paddle size should be 24" x 24".
2. STOP/SLOW paddles shall be retroreflective when used at night.
3. STOP/SLOW paddles may be attached to a staff with a minimum length of 6' to the bottom of the sign.
4. Any lights incorporated into the STOP or SLOW paddle faces shall only be as specifically described in Section 6E.03 Hand Signaling Devices in the TMUTCD.



SHEETING REQUIREMENTS (WHEN USED AT NIGHT)		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	RED	TYPE B OR C SHEETING
BACKGROUND	ORANGE	TYPE B <sub>FL</sub> OR C <sub>FL</sub> SHEETING
LEGEND & BORDER	WHITE	TYPE B OR C SHEETING
LEGEND & BORDER	BLACK	ACRYLIC NON-REFLECTIVE FILM

**CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS**

1. Permanent signs are used to give notice of traffic laws or regulations, call attention to conditions that are potentially hazardous to traffic operations, show route designations, destinations, directions, distances, services, points of interest, and other geographical, recreational, specific service (LOGO), or cultural information. Drivers proceeding through a work zone need the same, if not better route guidance as normally installed on a roadway without construction.
2. When permanent regulatory or warning signs conflict with work zone conditions, remove or cover the permanent signs until the permanent sign message matches the roadway condition. For details for covering large guide signs see the TS-CD standard.
3. When existing permanent signs are moved and relocated due to construction purposes, they shall be visible to motorists at all times.
4. If existing signs are to be relocated on their original supports, they shall be installed on crashworthy bases as shown on the SMD Standard sheets. The signs shall meet the required mounting heights shown on the BC Sheets or the SMD Standards. This work should be paid for under the appropriate pay item for relocating existing signs.
5. If permanent signs are to be removed and relocated using temporary supports, the Contractor shall use crashworthy supports as shown on the BC standard sheets, TLRs standard sheets or the CWZTCD list. The signs shall meet the required mounting heights shown on the BC, or the SMD standard sheets during construction. This work should be paid for under the appropriate pay item for relocating existing signs.
6. Any sign or traffic control device that is struck or damaged by the Contractor or his/her construction equipment shall be replaced as soon as possible by the Contractor to ensure proper guidance for the motorists. This will be subsidiary to Item 502.

**GENERAL NOTES FOR WORK ZONE SIGNS**

1. Contractor shall install and maintain signs in a straight and plumb condition and/or as directed by the Engineer.
2. Wooden sign posts shall be painted white.
3. Barricades shall NOT be used as sign supports.
4. All signs shall be installed in accordance with the plans or as directed by the Engineer. Signs shall be used to regulate, warn, and guide the traveling public safely through the work zone.
5. The Contractor may furnish either the sign design shown in the plans or in the "Standard Highway Sign Designs for Texas" (SHSD). The Engineer/Inspector may require the Contractor to furnish other work zone signs that are shown in the TMUTCD but may have been omitted from the plans. Any variation in the plans shall be documented by written agreement between the Engineer and the Contractor's Responsible Person. All changes must be documented in writing before being implemented. This can include documenting the changes in the Inspector's TxDOT diary and having both the Inspector and Contractor initial and date the agreed upon changes.
6. The Contractor shall furnish sign supports listed in the "Compliant Work Zone Traffic Control Device List" (CWZTCD) for small roadside signs. Supports for temporary large roadside signs shall meet the requirements detailed on the Temporary Large Roadside Signs (TLRS) standard sheets. The Contractor shall install the sign support in accordance with the manufacturer's recommendations. If there is a question regarding installation procedures, the Contractor shall furnish the Engineer a copy of the manufacturer's installation recommendations so the Engineer can verify the correct procedures are being followed.
7. The Contractor is responsible for installing signs on approved supports and replacing signs with damaged or cracked substrates and/or damaged or marred reflective sheeting as directed by the Engineer/Inspector.
8. Identification markings may be shown only on the back of the sign substrate. The maximum height of letters and/or company logos used for identification shall be 1 inch.
9. The Contractor shall replace damaged wood posts. New or damaged wood sign posts shall not be spliced.

**DURATION OF WORK (as defined by the "Texas Manual on Uniform Traffic Control Devices" Part 6)**

1. The types of sign supports, sign mounting height, the size of signs, and the type of sign substrates can vary based on the type of work being performed. The Engineer is responsible for selecting the appropriate size sign for the type of work being performed. The Contractor is responsible for ensuring the sign support, sign mounting height and substrate meets manufacturer's recommendations in regard to crashworthiness and duration of work requirements.
  - a. Long-term stationary - work that occupies a location more than 3 days.
  - b. Intermediate-term stationary - work that occupies a location more than one daylight period up to 3 days, or nighttime work lasting more than one hour.
  - c. Short-term stationary - daytime work that occupies a location for more than 1 hour in a single daylight period.
  - d. Short, duration - work that occupies a location up to 1 hour.
  - e. Mobile - work that moves continuously or intermittently (stopping for up to approximately 15 minutes).

**SIGN MOUNTING HEIGHT**

1. The bottom of Long-term/Intermediate-term signs shall be at least 7 feet, but not more than 9 feet, above the paved surface, except as shown for supplemental plaques mounted below other signs.
2. The bottom of Short-term/Short Duration signs shall be a minimum of 1 foot above the pavement surface but no more than 2 feet above the ground.
3. Long-term/Intermediate-term Signs may be used in lieu of Short-term/Short Duration signing.
4. Short-term/Short Duration signs shall be used only during daylight and shall be removed at the end of the workday or raised to appropriate Long-term/Intermediate sign height.
5. Regulatory signs shall be mounted at least 7 feet, but not more than 9 feet, above the paved surface regardless of work duration.

**SIZE OF SIGNS**

1. The Contractor shall furnish the sign sizes shown on BC (2) unless otherwise shown in the plans or as directed by the Engineer.

**SIGN SUBSTRATES**

1. The Contractor shall ensure the sign substrate is installed in accordance with the manufacturer's recommendations for the type of sign support that is being used. The CWZTCD lists each substrate that can be used on the different types and models of sign supports.
2. "Mesh" type materials are NOT an approved sign substrate, regardless of the tightness of the weave.
3. All wooden individual sign panels fabricated from 2 or more pieces shall have one or more plywood cleat, 1/2" thick by 6" wide, fastened to the back of the sign and extending fully across the sign. The cleat shall be attached to the back of the sign using wood screws that do not penetrate the face of the sign panel. The screws shall be placed on both sides of the splice and spaced at 6" centers. The Engineer may approve other methods of splicing the sign face.

**REFLECTIVE SHEETING**

1. All signs shall be retroreflective and constructed of sheeting meeting the color and retro-reflectivity requirements of DMS-8300 for rigid signs or DMS-8310 for roll-up signs. The web address for DMS specifications is shown on BC(1).
2. White sheeting, meeting the requirements of DMS-8300 Type A, shall be used for signs with a white background.
3. Orange sheeting, meeting the requirements of DMS-8300 Type B<sub>FL</sub> or Type C<sub>FL</sub>, shall be used for rigid signs with orange backgrounds.

**SIGN LETTERS**

1. All sign letters and numbers shall be clear, and open rounded type uppercase alphabet letters as approved by the Federal Highway Administration (FHWA) and as published in the "Standard Highway Sign Design for Texas" manual. Signs, letters and numbers shall be of first class workmanship in accordance with Department Standards and Specifications.

**REMOVING OR COVERING**

1. When sign messages may be confusing or do not apply, the signs shall be removed or completely covered.
2. Long-term stationary or intermediate stationary signs installed on square metal tubing may be turned away from traffic 90 degrees when the sign message is not applicable. This technique may not be used for signs installed in the median of divided highways or near any intersections where the sign may be seen from approaching traffic.
3. Signs installed on wooden skids shall not be turned at 90 degree angles to the roadway. These signs should be removed or completely covered when not required.
4. When signs are covered, the material used shall be opaque, such as heavy mil black plastic, or other materials which will cover the entire sign face and maintain their opaque properties under automobile headlights at night, without damaging the sign sheeting.
5. Burlap shall NOT be used to cover signs.
6. Duct tape or other adhesive material shall NOT be affixed to a sign face.
7. Signs and anchor stubs shall be removed and holes backfilled upon completion of work.

**SIGN SUPPORT WEIGHTS**

1. Where sign supports require the use of weights to keep from turning over, the use of sandbags with dry, cohesionless sand should be used.
2. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
3. Rock, concrete, iron, steel or other solid objects shall not be permitted for use as sign support weights.
4. Sandbags should weigh a minimum of 35 lbs and a maximum of 50 lbs.
5. Sandbags shall be made of a durable material that tears upon vehicular impact. Rubber (such as tire inner tubes) shall NOT be used.
6. Rubber ballasts designed for channelizing devices should not be used for ballast on portable sign supports. Sign supports designed and manufactured with rubber bases may be used when shown on the CWZTCD list.
7. Sandbags shall only be placed along or laid over the base supports of the traffic control device and shall not be suspended above ground level or hung with rope, wire, chains or other fasteners. Sandbags shall be placed along the length of the skids to weigh down the sign support.
8. Sandbags shall NOT be placed under the skid and shall not be used to level sign supports placed on slopes.

**FLAGS ON SIGNS**

1. Flags may be used to draw attention to warning signs. When used, the flag shall be 16 inches square or larger and shall be orange or fluorescent red-orange in color. Flags shall not be allowed to cover any portion of the sign face.

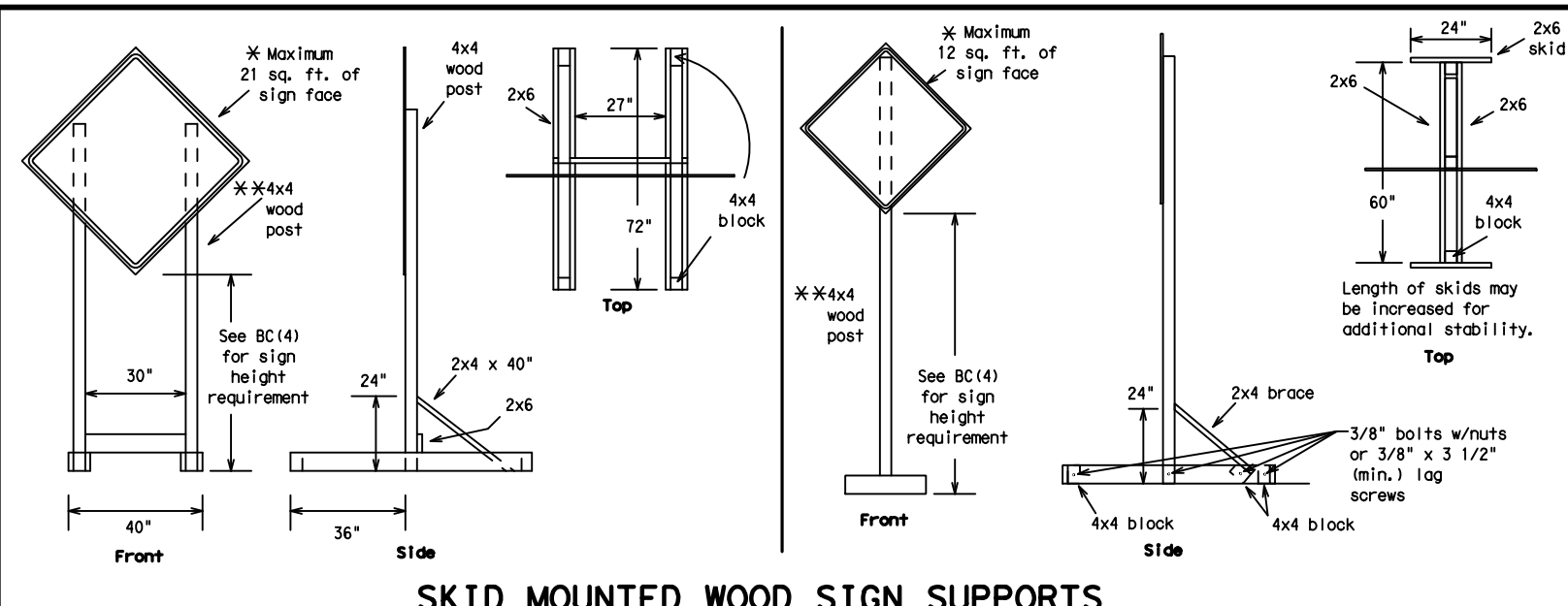


**BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES**

**BC(4)-21**

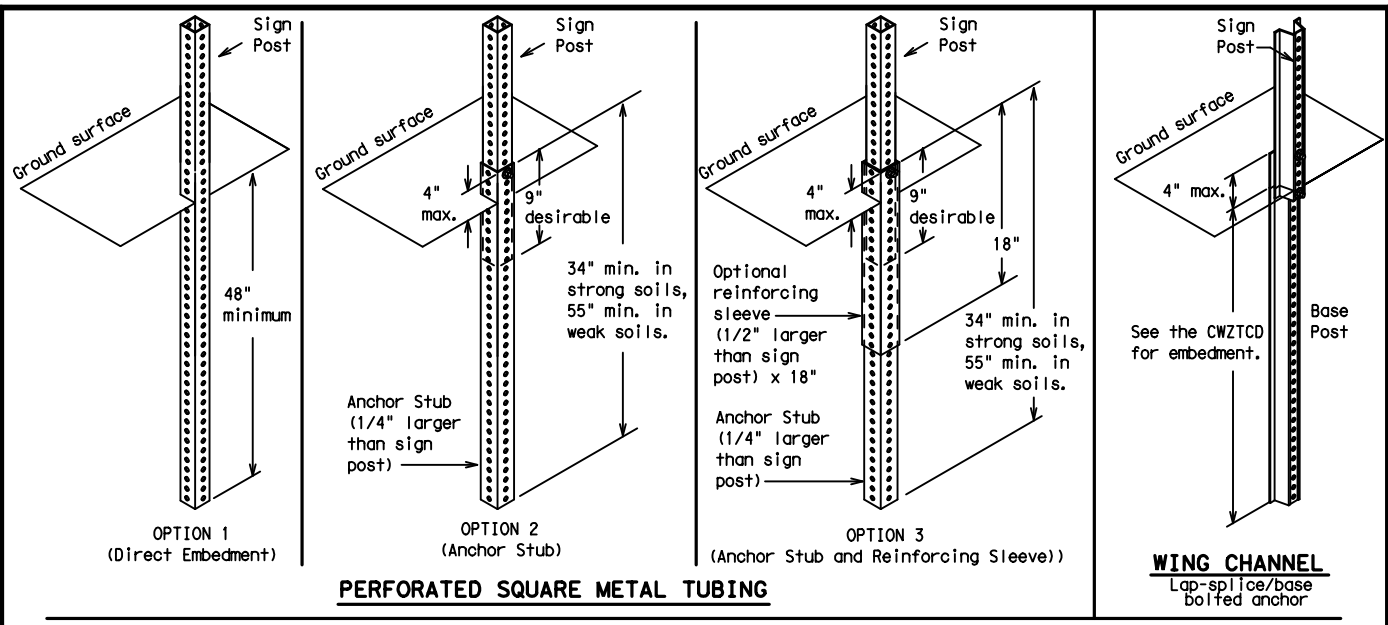
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© TxDOT	November 2002	CONT.	SECT.	JOB	HIGHWAY				
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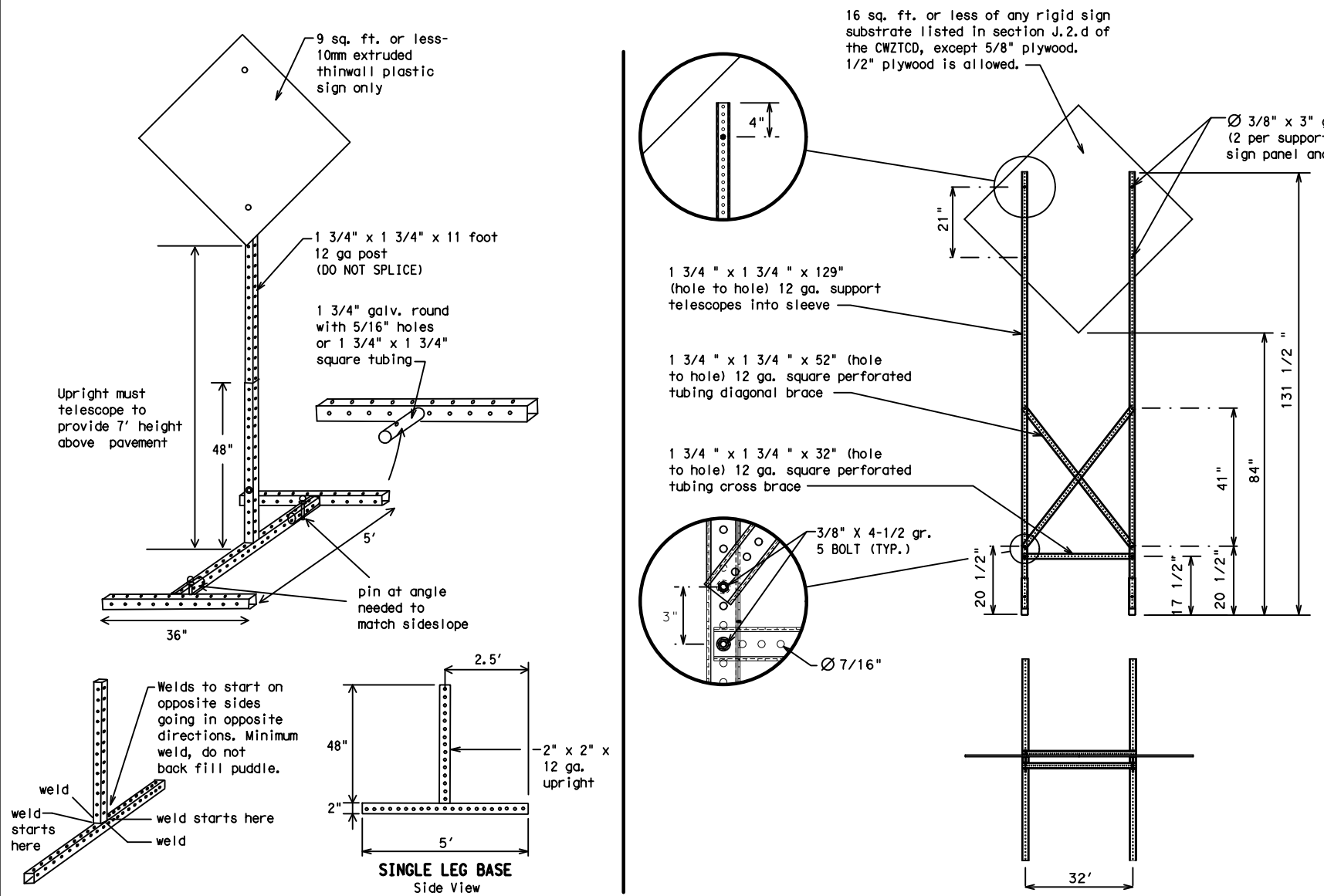
**SKID MOUNTED WOOD SIGN SUPPORTS**

\* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS



**GROUND MOUNTED SIGN SUPPORTS**

Refer to the CWZTCD and the manufacturer's installation procedure for each type sign support. The maximum sign square footage shall adhere to the manufacturer's recommendation. Two post installations can be used for larger signs.



**SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS**

\* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS

**WEDGE ANCHORS**  
 Both steel and plastic Wedge Anchor Systems as shown on the SMD Standard Sheets may be used as temporary sign supports for signs up to 10 square feet of sign face. They may be set in concrete or in sturdy soils if approved by the Engineer. (See web address for "Traffic Engineering Standard Sheets" on BC(1)).

**OTHER DESIGNS**  
 MORE DETAILS OF APPROVED LONG/INTERMEDIATE AND SHORT TERM SUPPORTS CAN BE FOUND ON THE CWZTCD LIST. SEE BC(1) FOR WEBSITE LOCATION.

- GENERAL NOTES**
1. Nails may be used in the assembly of wooden sign supports, but 3/8" bolts with nuts or 3/8" x 3 1/2" lag screws must be used on every joint for final connection.
  2. No more than 2 sign posts shall be placed within a 7 ft. circle, except for specific materials noted on the CWZTCD List.
  3. When project is completed, all sign supports and foundations shall be removed from the project site. This will be considered subsidiary to Item 502.
- \* See BC(4) for definition of "Work Duration."  
 \*\* Wood sign posts MUST be one piece. Splicing will NOT be allowed. Posts shall be painted white.  
 See the CWZTCD for the type of sign substrate that can be used for each approved sign support.

**BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT**

**BC(5)-21**

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WHEN NOT IN USE, REMOVE THE PCMS FROM THE RIGHT-OF-WAY OR PLACE THE PCMS BEHIND BARRIER OR GUARDRAIL WITH SIGN PANEL TURNED PARALLEL TO TRAFFIC

# RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

(The Engineer may approve other messages not specifically covered here.)

## PORTABLE CHANGEABLE MESSAGE SIGNS

- The Engineer/Inspector shall approve all messages used on portable changeable message signs (PCMS).
- Messages on PCMS should contain no more than 8 words (about four to eight characters per word), not including simple words such as "TO," "FOR," "AT," etc.
- Messages should consist of a single phase, or two phases that alternate. Three-phase messages are not allowed. Each phase of the message should convey a single thought, and must be understood by itself.
- Use the word "EXIT" to refer to an exit ramp on a freeway; i.e., "EXIT CLOSED." Do not use the term "RAMP."
- Always use the route or interstate designation (IH, US, SH, FM) along with the number when referring to a roadway.
- When in use, the bottom of a stationary PCMS message panel should be a minimum 7 feet above the roadway, where possible.
- The message term "WEEKEND" should be used only if the work is to start on Saturday morning and end by Sunday evening at midnight. Actual days and hours of work should be displayed on the PCMS if work is to begin on Friday evening and/or continue into Monday morning.
- The Engineer/Inspector may select one of two options which are available for displaying a two-phase message on a PCMS. Each phase may be displayed for either four seconds each or for three seconds each.
- Do not "flash" messages or words included in a message. The message should be steady burn or continuous while displayed.
- Do not present redundant information on a two-phase message; i.e., keeping two lines of the message the same and changing the third line.
- Do not use the word "Danger" in message.
- Do not display the message "LANES SHIFT LEFT" or "LANES SHIFT RIGHT" on a PCMS. Drivers do not understand the message.
- Do not display messages that scroll horizontally or vertically across the face of the sign.
- The following table lists abbreviated words and two-word phrases that are acceptable for use on a PCMS. Both words in a phrase must be displayed together. Words or phrases not on this list should not be abbreviated, unless shown in the TMUTCD.
- PCMS character height should be at least 18 inches for trailer mounted units. They should be visible from at least 1/2 (.5) mile and the text should be legible from at least 600 feet at night and 800 feet in daylight. Truck mounted units must have a character height of 10 inches and must be legible from at least 400 feet.
- Each line of text should be centered on the message board rather than left or right justified.
- If disabled, the PCMS should default to an illegible display that will not alarm motorists and will only be used to alert workers that the PCMS has malfunctioned. A pattern such as a series of horizontal solid bars is appropriate.

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## Phase 1: Condition Lists

### Road/Lane/Ramp Closure List

FREEWAY CLOSED X MILE	FRONTAGE ROAD CLOSED
ROAD CLOSED AT SH XXX	SHOULDER CLOSED XXX FT
ROAD CLSD AT FM XXXX	RIGHT LN CLOSED XXX FT
RIGHT X LANES CLOSED	RIGHT X LANES OPEN
CENTER LANE CLOSED	DAYTIME LANE CLOSURES
NIGHT LANE CLOSURES	I-XX SOUTH EXIT CLOSED
VARIOUS LANES CLOSED	EXIT XXX CLOSED X MILE
EXIT CLOSED	RIGHT LN TO BE CLOSED
MALL DRIVEWAY CLOSED	X LANES CLOSED TUE - FRI
XXXXXXXXX BLVD CLOSED	

### Other Condition List

ROADWORK XXX FT	ROAD REPAIRS XXXX FT
FLAGGER XXXX FT	LANE NARROWS XXXX FT
RIGHT LN NARROWS XXXX FT	TWO-WAY TRAFFIC XX MILE
MERGING TRAFFIC XXXX FT	CONST TRAFFIC XXX FT
LOOSE GRAVEL XXXX FT	UNEVEN LANES XXXX FT
DETOUR X MILE	ROUGH ROAD XXXX FT
ROADWORK PAST SH XXXX	ROADWORK NEXT FRI-SUN
BUMP XXXX FT	US XXX EXIT X MILES
TRAFFIC SIGNAL XXXX FT	LANES SHIFT *

\* LANES SHIFT in Phase 1 must be used with STAY IN LANE in Phase 2.

## Phase 2: Possible Component Lists

### Action to Take/Effect on Travel List

MERGE RIGHT	FORM X LINES RIGHT
DETOUR NEXT X EXITS	USE XXXXX RD EXIT
USE EXIT XXX	USE EXIT I-XX NORTH
STAY ON US XXX SOUTH	USE I-XX E TO I-XX N
TRUCKS USE US XXX N	WATCH FOR TRUCKS
WATCH FOR TRUCKS	EXPECT DELAYS
EXPECT DELAYS	PREPARE TO STOP
REDUCE SPEED XXX FT	END SHOULDER USE
USE OTHER ROUTES	WATCH FOR WORKERS
STAY IN LANE *	

### Location List

AT FM XXXX
BEFORE RAILROAD CROSSING
NEXT X MILES
PAST US XXX EXIT
XXXXXXXXX TO XXXXXXXX
US XXX TO FM XXXX

### Warning List

SPEED LIMIT XX MPH
MAXIMUM SPEED XX MPH
MINIMUM SPEED XX MPH
ADVISORY SPEED XX MPH
RIGHT LANE EXIT
USE CAUTION
DRIVE SAFELY
DRIVE WITH CARE

### \*\* Advance Notice List

TUE-FRI XX AM - X PM
APR XX-XX X PM-X AM
BEGINS MONDAY
BEGINS MAY XX
MAY X-X XX PM - XX AM
NEXT FRI-SUN
XX AM TO XX PM
NEXT TUE AUG XX
TONIGHT XX PM-XX AM

\*\* See Application Guidelines Note 6.

WORD OR PHRASE	ABBREVIATION	WORD OR PHRASE	ABBREVIATION
Access Road	ACCS RD	Major	MAJ
Alternate	ALT	Miles	MI
Avenue	AVE	Miles Per Hour	MPH
Best Route	BEST RTE	Minor	MNR
Boulevard	BLVD	Monday	MON
Bridge	BRDG	Normal	NORM
Cannot	CANT	North	N
Center	CTR	Northbound	(route) N
Construction Ahead	CONST AHD	Parking	PKING
CROSSING	XING	Road	RD
Detour Route	DETOUR RTE	Right Lane	RT LN
Do Not	DONT	Saturday	SAT
East	E	Service Road	SERV RD
Eastbound	(route) E	Shoulder	SHLDR
Emergency	EMER	Slippery	SLIP
Emergency Vehicle	EMER VEH	South	S
Entrance, Enter	ENT	Southbound	(route) S
Express Lane	EXP LN	Speed	SPD
Expressway	EXPWY	Street	ST
XXXX Feet	XXXX FT	Sunday	SUN
Fog Ahead	FOG AHD	Telephone	PHONE
Freeway	FRWY, FWY	Temporary	TEMP
Freeway Blocked	FWY BLKD	Thursday	THURS
Friday	FRI	To Downtown	TO DWNTN
Hazardous Driving	HAZ DRIVING	Traffic	TRAF
Hazardous Material	HAZMAT	Travelers	TRVLR
High-Occupancy Vehicle	HOV	Tuesday	TUES
Hour(s)	HR, HRS	Time Minutes	TIME MIN
Information	INFO	Upper Level	UPR LEVEL
It Is	ITS	Vehicles (s)	VEH, VEHS
Junction	JCT	Warning	WARN
Left	LFT	Wednesday	WED
Left Lane	LFT LN	Weight Limit	WT LIMIT
Lane Closed	LN CLOSED	West	W
Lower Level	LWR LEVEL	Westbound	(route) W
Maintenance	MAINT	Wet Pavement	WET PVMT
		Will Not	WONT

Roadway designation \* IH-number, US-number, SH-number, FM-number

## APPLICATION GUIDELINES

- Only 1 or 2 phases are to be used on a PCMS.
- The 1st phase (or both) should be selected from the "Road/Lane/Ramp Closure List" and the "Other Condition List".
- A 2nd phase can be selected from the "Action to Take/Effect on Travel, Location, General Warning, or Advance Notice Phase Lists".
- A Location Phase is necessary only if a distance or location is not included in the first phase selected.
- If two PCMS are used in sequence, they must be separated by a minimum of 1000 ft. Each PCMS shall be limited to two phases, and should be understandable by themselves.
- For advance notice, when the current date is within seven days of the actual work date, calendar days should be replaced with days of the week. Advance notification should typically be for no more than one week prior to the work.

## WORDING ALTERNATIVES

- The words RIGHT, LEFT and ALL can be interchanged as appropriate.
- Roadway designations IH, US, SH, FM and LP can be interchanged as appropriate.
- EAST, WEST, NORTH and SOUTH (or abbreviations E, W, N and S) can be interchanged as appropriate.
- Highway names and numbers replaced as appropriate.
- ROAD, HIGHWAY and FREEWAY can be interchanged as needed.
- AHEAD may be used instead of distances if necessary.
- FT and MI, MILE and MILES interchanged as appropriate.
- AT, BEFORE and PAST interchanged as needed.
- Distances or AHEAD can be eliminated from the message if a location phase is used.

PCMS SIGNS WITHIN THE R.O.W. SHALL BE BEHIND GUARDRAIL OR CONCRETE BARRIER OR SHALL HAVE A MINIMUM OF FOUR (4) PLASTIC DRUMS PLACED PERPENDICULAR TO TRAFFIC ON THE UPSTREAM SIDE OF THE PCMS, WHEN EXPOSED TO ONE DIRECTION OF TRAFFIC. WHEN EXPOSED TO TWO WAY TRAFFIC, THE FOUR DRUMS SHOULD BE PLACED WITH ONE DRUM AT EACH OF THE FOUR CORNERS OF THE UNIT.

## FULL MATRIX PCMS SIGNS

- When Full Matrix PCMS signs are used, the character height and legibility/visibility requirements shall be maintained as listed in Note 15 under "PORTABLE CHANGEABLE MESSAGE SIGNS" above.
- When symbol signs, such as the "Flagger Symbol" (CW20-7) are represented graphically on the Full Matrix PCMS sign and, with the approval of the Engineer, it shall maintain the legibility/visibility requirement listed above.
- When symbol signs are represented graphically on the Full Matrix PCMS, they shall only supplement the use of the static sign represented, and shall not substitute for, or replace that sign.
- A full matrix PCMS may be used to simulate a flashing arrow board provided it meets the visibility, flash rate and dimming requirements on BC(7), for the same size arrow.

SHEET 6 OF 12

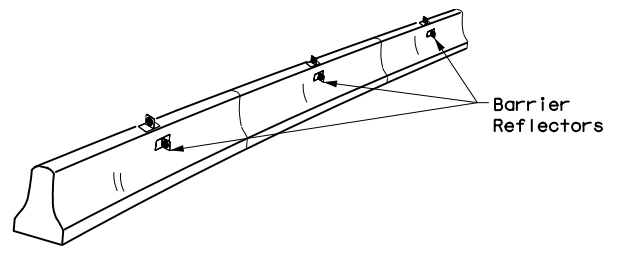
<h3>BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)</h3>			
<h2>BC (6) -21</h2>			
FILE:	bc-21.dgn	DN:	TxDOT
©TxDOT	November 2002	CR:	TxDOT
REVISIONS	0923	OW:	TxDOT
9-07	8-14	CR:	392
7-13	5-21	DIST:	COUNTY
		BWD:	COMANCHE
		SHEET NO.:	11

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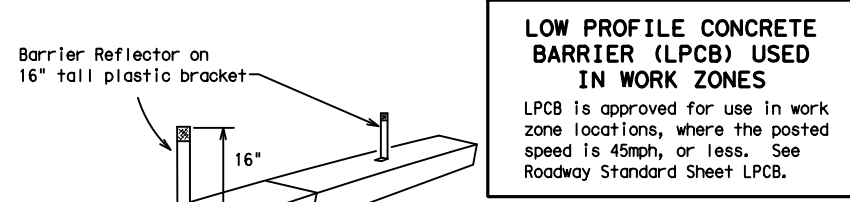
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- Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
- Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost of the reflectors shall be considered subsidiary to Item 512.



**CONCRETE TRAFFIC BARRIER (CTB)**

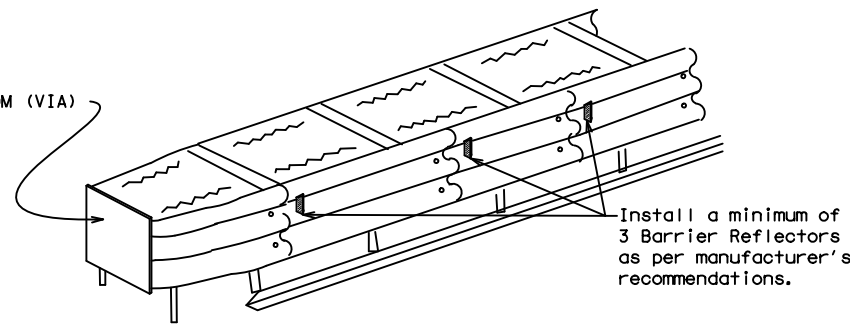
- Where traffic is on one side of the CTB, two (2) Barrier Reflectors shall be mounted in approximately the midsection of each section of CTB. An alternate mounting location is uniformly spaced at one end of each CTB. This will allow for attachment of a barrier grapple without damaging the reflector. The Barrier Reflector mounted on the side of the CTB shall be located directly below the reflector mounted on top of the barrier, as shown in the detail above.
- Where CTB separates two-way traffic, three barrier reflectors shall be mounted on each section of CTB. The reflector unit on top shall have two yellow reflective faces (Bi-Directional) while the reflectors on each side of the barrier shall have one yellow reflective face, as shown in the detail above.
- When CTB separates traffic traveling in the same direction, no barrier reflectors will be required on top of the CTB.
- Barrier Reflector units shall be yellow or white in color to match the edgeline being supplemented.
- Maximum spacing of Barrier Reflectors is forty (40) feet.
- Pavement markers or temporary flexible-reflective roadway marker tabs shall NOT be used as CTB delineation.
- Attachment of Barrier Reflectors to CTB shall be per manufacturer's recommendations.
- Missing or damaged Barrier Reflectors shall be replaced as directed by the Engineer.
- Single slope barriers shall be delineated as shown on the above detail.



**LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES**  
 LPCB is approved for use in work zone locations, where the posted speed is 45mph, or less. See Roadway Standard Sheet LPCB.

Barrier Reflector on 16" tall plastic bracket  
 Max. spacing of barrier reflectors is 20 feet. Attach the delineators as per manufacturer's recommendations.

**LOW PROFILE CONCRETE BARRIER (LPCB)**



**DELINEATION OF END TREATMENTS**

**END TREATMENTS FOR CTB'S USED IN WORK ZONES**  
 End treatments used on CTB's in work zones shall meet the appropriate crashworthy standards as defined in the Manual for Assessing Safety Hardware (MASH). Refer to the CWZTCD List for approved end treatments and manufacturers.

**BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS**

**WARNING LIGHTS**

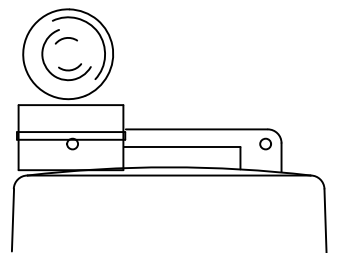
- Warning lights shall meet the requirements of the TMUTCD.
- Warning lights shall NOT be installed on barricades.
- Type A-Low Intensity Flashing Warning Lights are commonly used with drums. They are intended to warn of or mark a potentially hazardous area. Their use shall be as indicated on this sheet and/or other sheets of the plans by the designation "FL". The Type A Warning Lights shall not be used with signs manufactured with Type B<sub>FL</sub> or C<sub>FL</sub> Sheeting meeting the requirements of Departmental Material Specification DMS-8300.
- Type-C and Type D 360 degree Steady Burn Lights are intended to be used in a series for delineation to supplement other traffic control devices. Their use shall be as indicated on this sheet and/or other sheets of the plans by the designation "SB".
- The Engineer/Inspector or the plans shall specify the location and type of warning lights to be installed on the traffic control devices.
- When required by the Engineer, the Contractor shall furnish a copy of the warning lights certification. The warning light manufacturer will certify the warning lights meet the requirements of the latest ITE Purchase Specifications for Flashing and Steady-Burn Warning Lights.
- When used to delineate curves, Type-C and Type D Steady Burn Lights should only be placed on the outside of the curve, not the inside.
- The location of warning lights and warning reflectors on drums shall be as shown elsewhere in the plans.

**WARNING LIGHTS MOUNTED ON PLASTIC DRUMS**

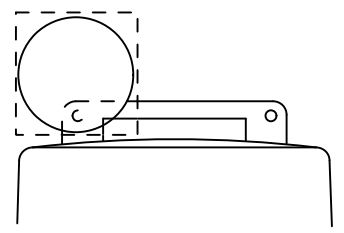
- Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
- Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
- A series of sequential flashing warning lights placed on channelizing devices to form a merging taper may be used for delineation. If used, the successive flashing of the sequential warning lights should occur from the beginning of the taper to the end of the merging taper in order to identify the desired vehicle path. The rate of flashing for each light shall be 65 flashes per minute, plus or minus 10 flashes.
- Type C and D steady-burn warning lights are intended to be used in a series to delineate the edge of the travel lane on detours, on lane changes, on lane closures, and on other similar conditions.
- Type A, Type C and Type D warning lights shall be installed at locations as detailed on other sheets in the plans.
- Warning lights shall not be installed on a drum that has a sign, chevron or vertical panel.
- The maximum spacing for warning lights on drums should be identical to the channelizing device spacing.

**WARNING REFLECTORS MOUNTED ON PLASTIC DRUMS AS A SUBSTITUTE FOR TYPE C (STEADY BURN) WARNING LIGHTS**

- A warning reflector or approved substitute may be mounted on a plastic drum as a substitute for a Type C, steady burn warning light at the discretion of the Contractor unless otherwise noted in the plans.
- The warning reflector shall be yellow in color and shall be manufactured using a sign substrate approved for use with plastic drums listed on the CWZTCD.
- The warning reflector shall have a minimum retroreflective surface area (one-side) of 30 square inches.
- Round reflectors shall be fully reflectorized, including the area where attached to the drum.
- Square substrates must have a minimum of 30 square inches of reflectorized sheeting. They do not have to be reflectorized where it attaches to the drum.
- The side of the warning reflector facing approaching traffic shall have sheeting meeting the color and retroreflectivity requirements for DMS 8300-Type B or Type C.
- When used near two-way traffic, both sides of the warning reflector shall be reflectorized.
- The warning reflector should be mounted on the side of the handle nearest approaching traffic.
- The maximum spacing for warning reflectors should be identical to the channelizing device spacing requirements.



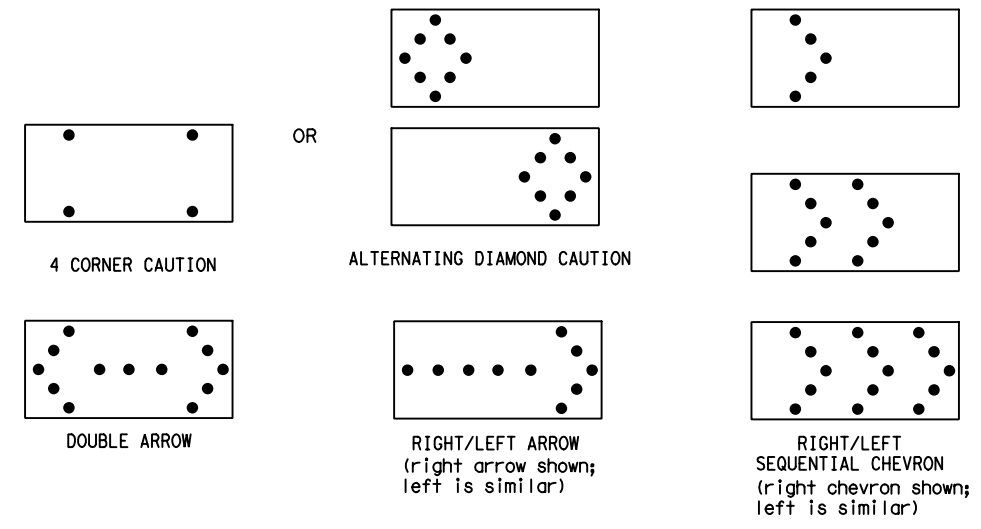
Type C Warning Light or approved substitute mounted on a drum adjacent to the travel way.



Warning reflector may be round or square. Must have a yellow reflective surface area of at least 30 square inches

Arrow Boards may be located behind channelizing devices in place for a shoulder taper or merging taper, otherwise they shall be delineated with four (4) channelizing devices placed perpendicular to traffic on the upstream side of traffic.

- The Flashing Arrow Board should be used for all lane closures on multi-lane roadways, or slow moving maintenance or construction activities on the travel lanes.
- Flashing Arrow Boards should not be used on two-lane, two-way roadways, detours, diversions or work on shoulders unless the "CAUTION" display (see detail below) is used.
- The Engineer/Inspector shall choose all appropriate signs, barricades and/or other traffic control devices that should be used in conjunction with the Flashing Arrow Board.
- The Flashing Arrow Board should be able to display the following symbols:



- The "CAUTION" display consists of four corner lamps flashing simultaneously, or the Alternating Diamond Caution mode as shown.
- The straight line caution display is NOT ALLOWED.
- The Flashing Arrow Board shall be capable of minimum 50 percent dimming from rated lamp voltage. The flashing rate of the lamps shall not be less than 25 nor more than 40 flashes per minute.
- Minimum lamp "on time" shall be approximately 50 percent for the flashing arrow and equal intervals of 25 percent for each sequential phase of the flashing chevron.
- The sequential arrow display is NOT ALLOWED.
- The flashing arrow display is the TxDOT standard; however, the sequential chevron display may be used during daylight operations.
- The Flashing Arrow Board shall be mounted on a vehicle, trailer or other suitable support.
- A Flashing Arrow Board SHALL NOT BE USED to laterally shift traffic.
- A full matrix PCMS may be used to simulate a Flashing Arrow Board provided it meets visibility, flash rate and dimming requirements on this sheet for the same size arrow.
- Minimum mounting height of trailer mounted Arrow Boards should be 7 feet from roadway to bottom of panel.

REQUIREMENTS			
TYPE	MINIMUM SIZE	MINIMUM NUMBER OF PANEL LAMPS	MINIMUM VISIBILITY DISTANCE
B	30 x 60	13	3/4 mile
C	48 x 96	15	1 mile

**ATTENTION**  
 Flashing Arrow Boards shall be equipped with automatic dimming devices.

WHEN NOT IN USE, REMOVE THE ARROW BOARD FROM THE RIGHT-OF-WAY OR PLACE THE ARROW BOARD BEHIND CONCRETE TRAFFIC BARRIER OR GUARDRAIL.

**FLASHING ARROW BOARDS**

SHEET 7 OF 12

**TRUCK-MOUNTED ATTENUATORS**

- Truck-mounted attenuators (TMA) used on TxDOT facilities must meet the requirements outlined in the Manual for Assessing Safety Hardware (MASH).
- Refer to the CWZTCD for the requirements of Level 2 or Level 3 TMAs.
- Refer to the CWZTCD for a list of approved TMAs.
- TMAs are required on freeways unless otherwise noted in the plans.
- A TMA should be used anytime that it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the work performance.
- The only reason a TMA should not be required is when a work area is spread down the roadway and the work crew is an extended distance from the TMA.



**BARRICADE AND CONSTRUCTION ARROW PANEL, REFLECTORS, WARNING LIGHTS & ATTENUATOR**

**BC (7) -21**

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© TxDOT	November 2002	CONT	SECT	JOB	HIGHWAY				
REVISIONS		0923	17	084	CR 392				
9-07	8-14	DIST	COUNTY	SHEET NO.					
7-13	5-21	BWD	COMANCHE	12					

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**GENERAL NOTES**

- For long term stationary work zones on freeways, drums shall be used as the primary channelizing device.
- For intermediate term stationary work zones on freeways, drums should be used as the primary channelizing device but may be replaced in tangent sections by vertical panels, or 42" two-piece cones. In tangent sections, one-piece cones may be used with the approval of the Engineer but only if personnel are present on the project at all times to maintain the cones in proper position and location.
- For short term stationary work zones on freeways, drums are the preferred channelizing device but may be replaced in tapers, transitions and tangent sections by vertical panels, two-piece cones or one-piece cones as approved by the Engineer.
- Drums and all related items shall comply with the requirements of the current version of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) and the "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
- Drums, bases, and related materials shall exhibit good workmanship and shall be free from objectionable marks or defects that would adversely affect their appearance or serviceability.
- The Contractor shall have a maximum of 24 hours to replace any plastic drums identified for replacement by the Engineer/Inspector. The replacement device must be an approved device.

**GENERAL DESIGN REQUIREMENTS**

Pre-qualified plastic drums shall meet the following requirements:

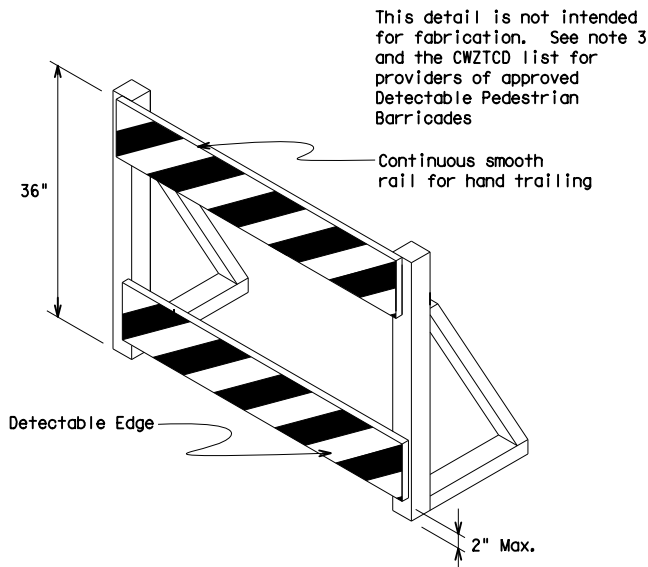
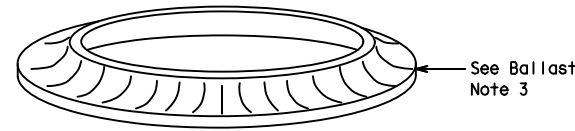
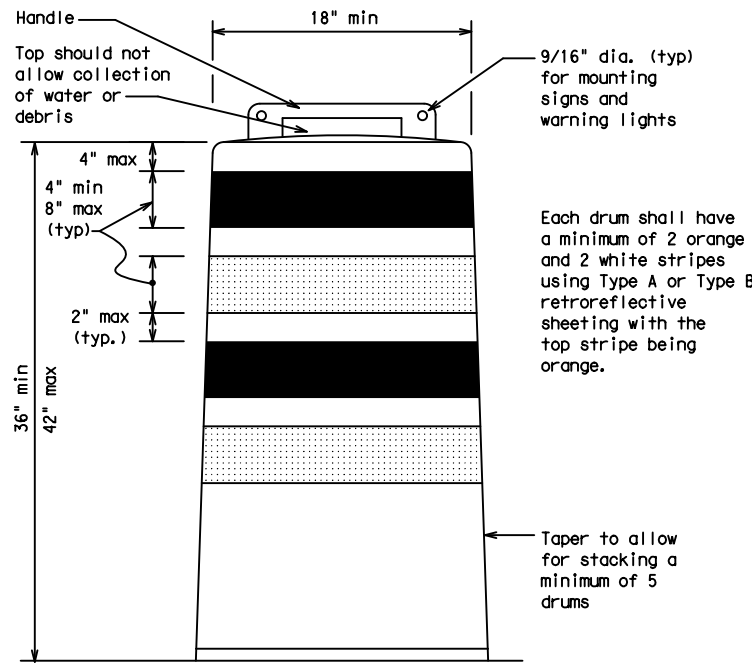
- Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
- The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents accidental separation due to normal handling and/or air turbulence created by passing vehicles.
- Plastic drums shall be constructed of lightweight flexible, and deformable materials. The Contractor shall NOT use metal drums or single piece plastic drums as channelization devices or sign supports.
- Drums shall present a profile that is a minimum of 18 inches in width at the 36 inch height when viewed from any direction. The height of drum unit (body installed on base) shall be a minimum of 36 inches and a maximum of 42 inches.
- The top of the drum shall have a built-in handle for easy pickup and shall be designed to drain water and not collect debris. The handle shall have a minimum of two widely spaced 9/16 inch diameter holes to allow attachment of a warning light, warning reflector unit or approved compliant sign.
- The exterior of the drum body shall have a minimum of four alternating orange and white retroreflective circumferential stripes not less than 4 inches nor greater than 8 inches in width. Any non-reflectorized space between any two adjacent stripes shall not exceed 2 inches in width.
- Bases shall have a maximum width of 36 inches, a maximum height of 4 inches, and a minimum of two footholds of sufficient size to allow base to be held down while separating the drum body from the base.
- Plastic drums shall be constructed of ultra-violet stabilized, orange, high-density polyethylene (HDPE) or other approved material.
- Drum body shall have a maximum unballasted weight of 11 lbs.
- Drum and base shall be marked with manufacturer's name and model number.

**RETROREFLECTIVE SHEETING**

- The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
- The sheeting shall be suitable for use on and shall adhere to the drum surface such that, upon vehicular impact, the sheeting shall remain adhered in-place and exhibit no delaminating, cracking, or loss of retroreflectivity other than that loss due to abrasion of the sheeting surface.

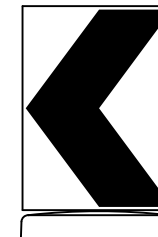
**BALLAST**

- Unballasted bases shall be large enough to hold up to 50 lbs. of sand. This base, when filled with the ballast material, should weigh between 35 lbs (minimum) and 50 lbs (maximum). The ballast may be sand in one to three sandbags separate from the base, sand in a sand-filled plastic base, or other ballasting devices as approved by the Engineer. Stacking of sandbags will be allowed, however height of sandbags above pavement surface may not exceed 12 inches.
- Bases with built-in ballast shall weigh between 40 lbs. and 50 lbs. Built-in ballast can be constructed of an integral crumb rubber base or a solid rubber base.
- Recycled truck tire sidewalls may be used for ballast on drums approved for this type of ballast on the CWZTCD list.
- The ballast shall not be heavy objects, water, or any material that would become hazardous to motorists, pedestrians, or workers when the drum is struck by a vehicle.
- When used in regions susceptible to freezing, drums shall have drainage holes in the bottoms so that water will not collect and freeze becoming a hazard when struck by a vehicle.
- Ballast shall not be placed on top of drums.
- Adhesives may be used to secure base of drums to pavement.

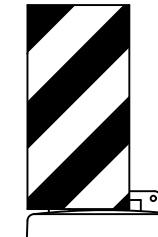


**DETECTABLE PEDESTRIAN BARRICADES**

- When existing pedestrian facilities are disrupted, closed, or relocated in a TTC zone, the temporary facilities shall be detectable and include accessibility features consistent with the features present in the existing pedestrian facility. Refer to WZ(BTS-2) for Pedestrian Control requirements for Sidewalk Diversions, Sidewalk Detours and Crosswalk Closures.
- Where pedestrians with visual disabilities normally use the closed sidewalk, a Detectable Pedestrian Barricade shall be placed across the full width of the closed sidewalk instead of a Type 3 Barricade.
- Detectable pedestrian barricades similar to the one pictured above, longitudinal channelizing devices, some concrete barriers, and wood or chain link fencing with a continuous detectable edging can satisfactorily delineate a pedestrian path.
- Tape, rope, or plastic chain strung between devices are not detectable, do not comply with the design standards in the "Americans with Disabilities Act Accessibility Guidelines (ADAAG)" and should not be used as a control for pedestrian movements.
- Warning lights shall not be attached to detectable pedestrian barricades.
- Detectable pedestrian barricades should use 8" nominal barricade rails as shown on BC(10) provided that the top rail provides a smooth continuous rail suitable for hand trailing with no splinters, burrs, or sharp edges.



18" x 24" Sign  
(Maximum Sign Dimension)  
Chevron CW1-8, Opposing Traffic Lane Divider, Driveway sign D70a, Keep Right R4 series or other signs as approved by Engineer



12" x 24" Vertical Panel  
mount with diagonals sloping down towards travel way

Plywood, Aluminum or Metal sign substrates shall NOT be used on plastic drums

**SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS**

- Signs used on plastic drums shall be manufactured using substrates listed on the CWZTCD.
- Chevrons and other work zone signs with an orange background shall be manufactured with Type B<sub>FL</sub> or Type C<sub>FL</sub> Orange sheeting meeting the color and retroreflectivity requirements of DMS-8300, "Sign Face Material," unless otherwise specified in the plans.
- Vertical Panels shall be manufactured with orange and white sheeting meeting the requirements of DMS-8300 Type A or Type B. Diagonal stripes on Vertical Panels shall slope down toward the intended traveled lane.
- Other sign messages (text or symbolic) may be used as approved by the Engineer. Sign dimensions shall not exceed 18 inches in width or 24 inches in height, except for the R9 series signs discussed in note 8 below.
- Signs shall be installed using a 1/2 inch bolt (nominal) and nut, two washers, and one locking washer for each connection.
- Mounting bolts and nuts shall be fully engaged and adequately torqued. Bolts should not extend more than 1/2 inch beyond nuts.
- Chevrons may be placed on drums on the outside of curves, on merging tapers or on shifting tapers. When used in these locations, they may be placed on every drum or spaced not more than on every third drum. A minimum of three (3) should be used at each location called for in the plans.
- R9-9, R9-10, R9-11 and R9-11a Sidewalk Closed signs which are 24 inches wide may be mounted on plastic drums, with approval of the Engineer.

SHEET 8 OF 12



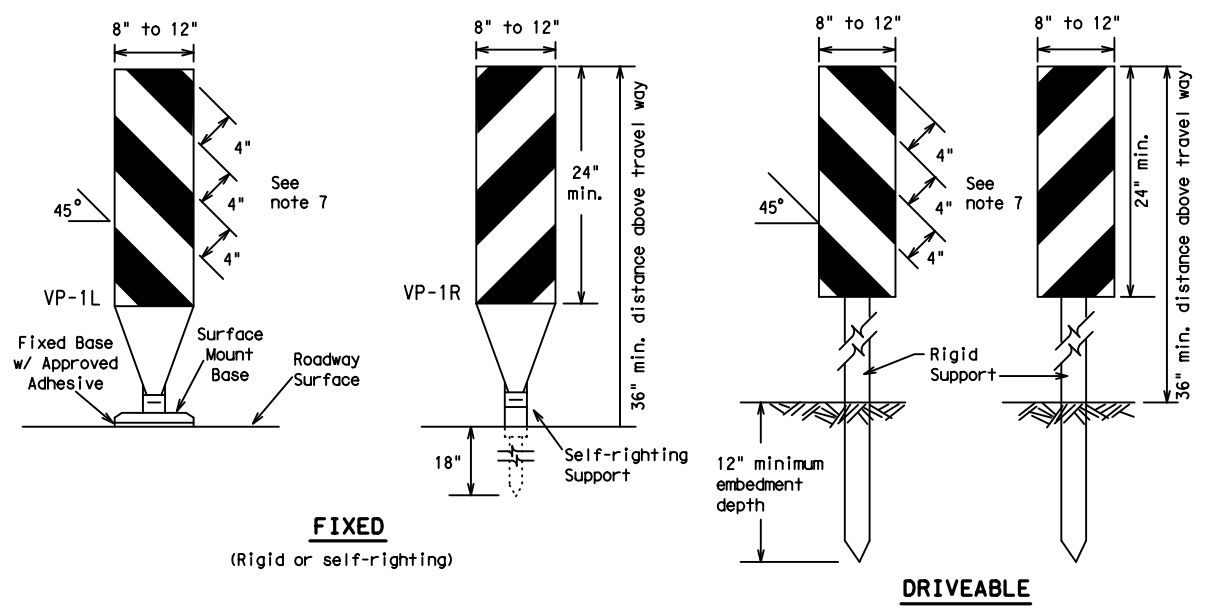
**BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES**

**BC(8)-21**

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9-07	5-21								
7-13									

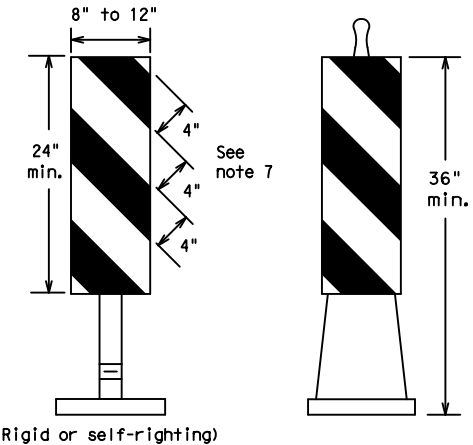
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**FIXED**  
(Rigid or self-righting)

**DRIVEABLE**

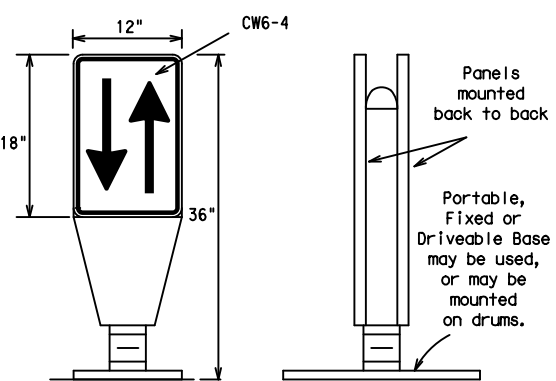


(Rigid or self-righting)

**PORTABLE**

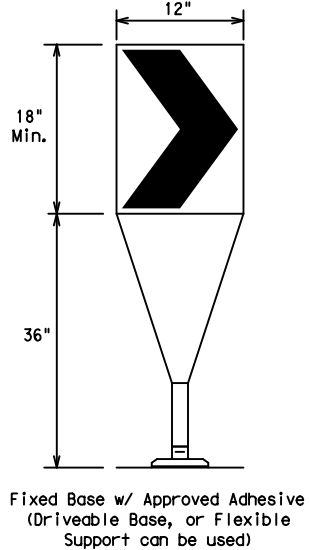
**VERTICAL PANELS (VPs)**

1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is required. The Engineer/Inspector shall refer to the Roadway Design Manual for additional requirements on the use VP's for drop-offs.
3. VP's should be mounted back to back if used at the edge of cuts adjacent to two-way two lane roadways. Stripes are to be reflective orange and reflective white and should always slope downward toward the travel lane.
4. VP's used on expressways and freeways or other high speed roadways, may have more than 270 square inches of retroreflective area facing traffic.
5. Self-righting supports are available with portable base. See "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
6. Sheeting for the VP's shall be retroreflective Type A or Type B conforming to Departmental Material Specification DMS-8300, unless noted otherwise.
7. Where the height of reflective material on the vertical panel is 36 inches or greater, a panel stripe of 6 inches shall be used.



**OPPOSING TRAFFIC LANE DIVIDERS (OTLD)**

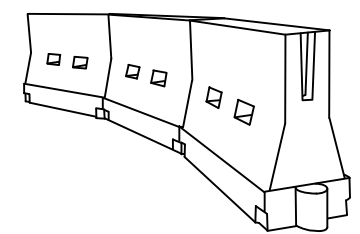
1. Opposing Traffic Lane Dividers (OTLD) are delineation devices designed to convert a normal one-way roadway section to two-way operation. OTLD's are used on temporary centerlines. The upward and downward arrows on the sign's face indicate the direction of traffic on either side of the divider. The base is secured to the pavement with an adhesive or rubber weight to minimize movement caused by a vehicle impact or wind gust.
2. The OTLD may be used in combination with 42" cones or VPs.
3. Spacing between the OTLD shall not exceed 500 feet. 42" cones or VPs placed between the OTLD's should not exceed 100 foot spacing.
4. The OTLD shall be orange with a black non-reflective legend. Sheeting for the OTLD shall be retroreflective Type B<sub>FL</sub> or Type C<sub>FL</sub> conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall meet the requirements of DMS-8300.



Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

**CHEVRONS**

1. The chevron shall be a vertical rectangle with a minimum size of 12 by 18 inches.
2. Chevrons are intended to give notice of a sharp change of alignment with the direction of travel and provide additional emphasis and guidance for vehicle operators with regard to changes in horizontal alignment of the roadway.
3. Chevrons, when used, shall be erected on the outside of a sharp curve or turn, or on the far side of an intersection. They shall be in line with and at right angles to approaching traffic. Spacing should be such that the motorist always has three in view, until the change in alignment eliminates its need.
4. To be effective, the chevron should be visible for at least 500 feet.
5. Chevrons shall be orange with a black nonreflective legend. Sheeting for the chevron shall be retroreflective Type B<sub>FL</sub> or Type C<sub>FL</sub> conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall meet the requirements of DMS-8300.
6. For Long Term Stationary use on tapers or transitions on freeways and divided highways, self-righting chevrons may be used to supplement plastic drums but not to replace plastic drums.



**LONGITUDINAL CHANNELIZING DEVICES (LCD)**

1. LCDs are crashworthy, lightweight, deformable devices that are highly visible, have good target value and can be connected together. They are not designed to contain or redirect a vehicle on impact.
2. LCDs may be used instead of a line of cones or drums.
3. LCDs shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
4. LCDs should not be used to provide positive protection for obstacles, pedestrians or workers.
5. LCDs shall be supplemented with retroreflective delineation as required for temporary barriers on BC(7) when placed roughly parallel to the travel lanes.
6. LCDs used as barricades placed perpendicular to traffic should have at least one row of reflective sheeting meeting the requirements for barricade rails as shown on BC(10). Place reflective sheeting near the top of the LCD along the full length of the device.

**WATER BALLASTED SYSTEMS USED AS BARRIERS**

1. Water ballasted systems used as barriers shall not be used solely to channelize road users, but also to protect the work space per the appropriate Manual for Assessing Safety Hardware (MASH) crashworthiness requirements based on roadway speed and barrier application.
2. Water ballasted systems used to channelize vehicular traffic shall be supplemented with retroreflective delineation or channelizing devices to improve daytime/nighttime visibility. They may also be supplemented with pavement markings.
3. Water ballasted systems used as barriers shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
4. Water ballasted systems used as barriers should not be used for a merging taper except in low speed (less than 45 MPH) urban areas. When used on a taper in a low speed urban area, the taper shall be delineated and the taper length should be designed to optimize road user operations considering the available geometric conditions.
5. When water ballasted systems used as barriers have blunt ends exposed to traffic, they should be attenuated as per manufacturer recommendations or flared to a point outside the clear zone.

If used to channelize pedestrians, longitudinal channelizing devices or water ballasted systems must have a continuous detectable bottom for users of long canes and the top of the unit shall not be less than 32 inches in height.

**HOLLOW OR WATER BALLASTED SYSTEMS USED AS LONGITUDINAL CHANNELIZING DEVICES OR BARRIERS**

**GENERAL NOTES**

1. Work Zone channelizing devices illustrated on this sheet may be installed in close proximity to traffic and are suitable for use on high or low speed roadways. The Engineer/Inspector shall ensure that spacing and placement is uniform and in accordance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
2. Channelizing devices shown on this sheet may have a driveable, fixed or portable base. The requirement for self-righting channelizing devices must be specified in the General Notes or other plan sheets.
3. Channelizing devices on self-righting supports should be used in work zone areas where channelizing devices are frequently impacted by errant vehicles or vehicle related wind gusts making alignment of the channelizing devices difficult to maintain. Locations of these devices shall be detailed elsewhere in the plans. These devices shall conform to the TMUTCD and the "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
4. The Contractor shall maintain devices in a clean condition and replace damaged, nonreflective, faded, or broken devices and bases as required by the Engineer/Inspector. The Contractor shall be required to maintain proper device spacing and alignment.
5. Portable bases shall be fabricated from virgin and/or recycled rubber. The portable bases shall weigh a minimum of 30 lbs.
6. Pavement surfaces shall be prepared in a manner that ensures proper bonding between the adhesives, the fixed mount bases and the pavement surface. Adhesives shall be prepared and applied according to the manufacturer's recommendations.
7. The installation and removal of channelizing devices shall not cause detrimental effects to the final pavement surfaces, including pavement surface discoloration or surface integrity. Driveable bases shall not be permitted on final pavement surfaces. The Engineer/Inspector shall approve all application and removal procedures of fixed bases.

Posted Speed	Formula	Minimum Desirable Taper Lengths **			Suggested Maximum Spacing of Channelizing Devices	
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent
30	L = WS <sup>2</sup> / 60	150'	165'	180'	30'	60'
35		205'	225'	245'	35'	70'
40		265'	295'	320'	40'	80'
45	L = WS	450'	495'	540'	45'	90'
50		500'	550'	600'	50'	100'
55		550'	605'	660'	55'	110'
60		600'	660'	720'	60'	120'
65		650'	715'	780'	65'	130'
70		700'	770'	840'	70'	140'
75		750'	825'	900'	75'	150'
80		800'	880'	960'	80'	160'

\*\*Taper lengths have been rounded off.  
 L=Length of Taper (FT.) W=Width of Offset (FT.)  
 S=Posted Speed (MPH)

**SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS**

SHEET 9 OF 12



**BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES**

**BC (9) -21**

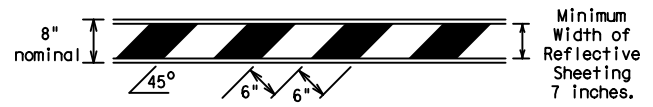
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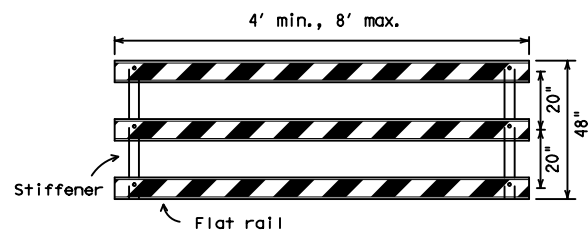
**TYPE 3 BARRICADES**

1. Refer to the Compliant Work Zone Traffic Control Devices List (CWZTCD) for details of the Type 3 Barricades and a list of all materials used in the construction of Type 3 Barricades.
2. Type 3 Barricades shall be used at each end of construction projects closed to all traffic.
3. Barricades extending across a roadway should have stripes that slope downward in the direction toward which traffic must turn in detouring. When both right and left turns are provided, the chevron striping may slope downward in both directions from the center of the barricade. Where no turns are provided at a closed road, striping should slope downward in both directions toward the center of roadway.
4. Striping of rails, for the right side of the roadway, should slope downward to the left. For the left side of the roadway, striping should slope downward to the right.
5. Identification markings may be shown only on the back of the barricade rails. The maximum height of letters and/or company logos used for identification shall be 1".
6. Barricades shall not be placed parallel to traffic unless an adequate clear zone is provided.
7. Warning lights shall NOT be installed on barricades.
8. Where barricades require the use of weights to keep from turning over, the use of sandbags with dry, cohesionless sand is recommended. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight. Sand bags shall not be stacked in a manner that covers any portion of a barricade rails reflective sheeting. Rock, concrete, iron, steel or other solid objects will NOT be permitted. Sandbags should weigh a minimum of 35 lbs and a maximum of 50 lbs. Sandbags shall be made of a durable material that tears upon vehicular impact. Rubber (such as tire inner tubes) shall not be used for sandbags. Sandbags shall only be placed along or upon the base supports of the device and shall not be suspended above ground level or hung with rope, wire, chains or other fasteners.
9. Sheeting for barricades shall be retroreflective Type A or Type B conforming to Departmental Material Specification DMS-8300 unless otherwise noted.

Barricades shall NOT be used as a sign support.

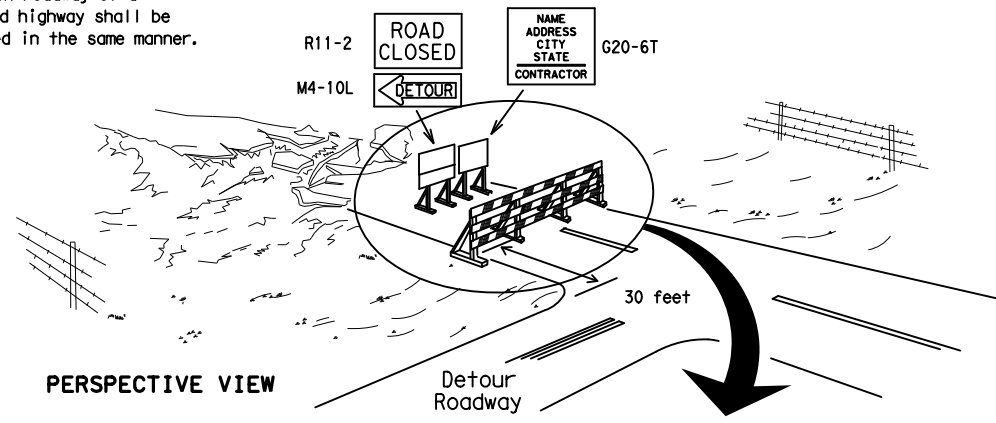


**TYPICAL STRIPING DETAIL FOR BARRICADE RAIL**



**TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES**

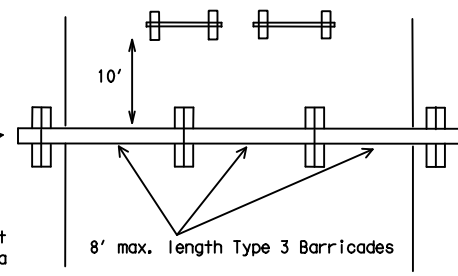
Each roadway of a divided highway shall be barricaded in the same manner.



PERSPECTIVE VIEW

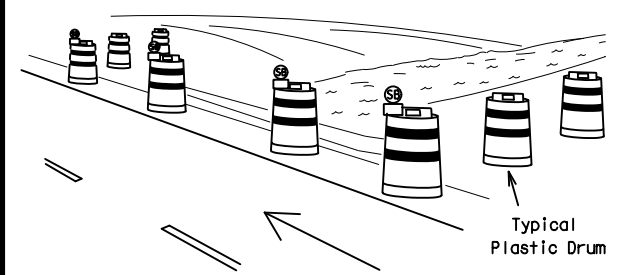
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic. Barricade striping should slant downward in the direction of detour.

1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

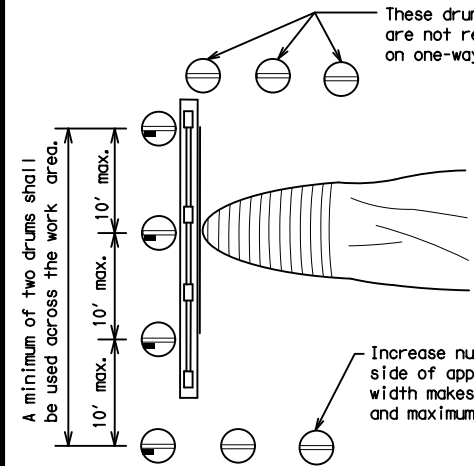


PLAN VIEW

**TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION**



PERSPECTIVE VIEW

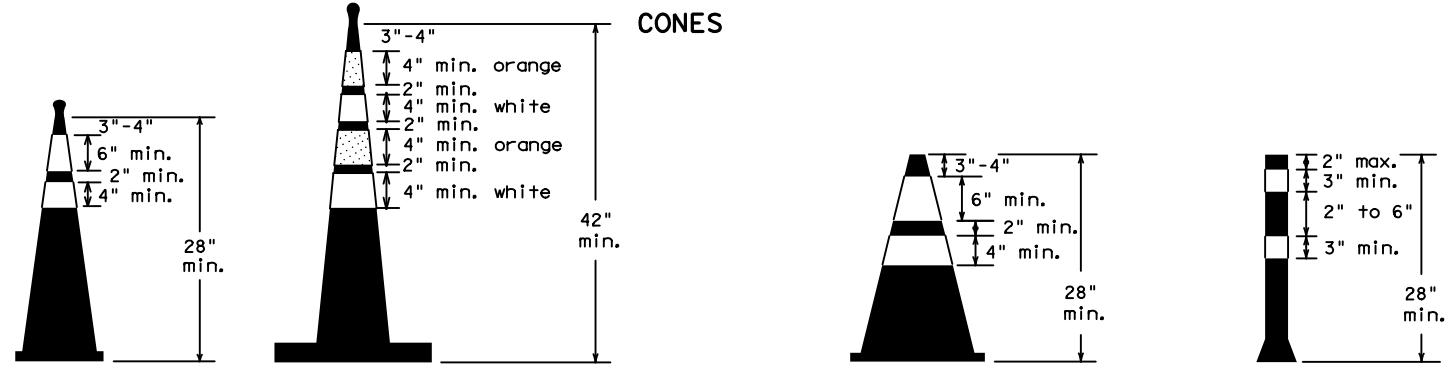


PLAN VIEW

1. Where positive redirection capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder width is greater than 12 feet, steady-burn lights may be omitted if drums are used.
5. Drums must extend the length of the culvert widening.

LEGEND	
	Plastic drum
	Plastic drum with steady burn light or yellow warning reflector
	Steady burn warning light or yellow warning reflector

**CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS**



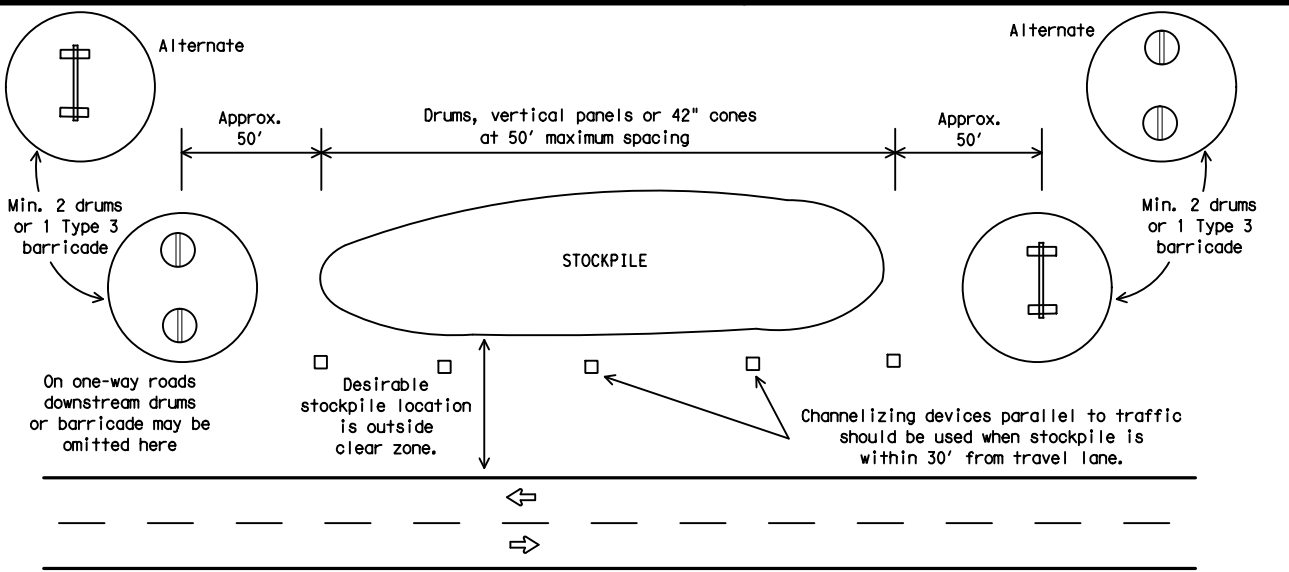
Two-Piece cones

One-Piece cones

Tubular Marker

28" Cones shall have a minimum weight of 9 1/2 lbs.  
 42" 2-piece cones shall have a minimum weight of 30 lbs. including base.

1. Traffic cones and tubular markers shall be predominantly orange, and meet the height and weight requirements shown above.
2. One-piece cones have the body and base of the cone molded in one consolidated unit. Two-piece cones have a cone shaped body and a separate rubber base, or ballast, that is added to keep the device upright and in place.
3. Two-piece cones may have a handle or loop extending up to 8" above the minimum height shown, in order to aid in retrieving the device.
4. Cones or tubular markers shall have white or white and orange reflective bands as shown above. The reflective bands shall have a smooth, sealed outer surface and meet the requirements of Departmental Material Specification DMS-8300 Type A or Type B.
5. 28" cones and tubular markers are generally suitable for short duration and short-term stationary work as defined on BC(4). These should not be used for intermediate-term or long-term stationary work unless personnel is on-site to maintain them in their proper upright position.
6. 42" two-piece cones, vertical panels or drums are suitable for all work zone durations.
7. Cones or tubular markers used on each project should be of the same size and shape.



**TRAFFIC CONTROL FOR MATERIAL STOCKPILES**



**BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES**

**BC(10)-21**

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## WORK ZONE PAVEMENT MARKINGS

### GENERAL

- The Contractor shall be responsible for maintaining work zone and existing pavement markings, in accordance with the standard specifications and special provisions, on all roadways open to traffic within the CSJ limits unless otherwise stated in the plans.
- Color, patterns and dimensions shall be in conformance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
- Additional supplemental pavement marking details may be found in the plans or specifications.
- Pavement markings shall be installed in accordance with the TMUTCD and as shown on the plans.
- When short term markings are required on the plans, short term markings shall conform with the TMUTCD, the plans and details as shown on the Standard Plan Sheet WZ(STPM).
- When standard pavement markings are not in place and the roadway is opened to traffic, DO NOT PASS signs shall be erected to mark the beginning of the sections where passing is prohibited and PASS WITH CARE signs at the beginning of sections where passing is permitted.
- All work zone pavement markings shall be installed in accordance with Item 662, "Work Zone Pavement Markings."

### RAISED PAVEMENT MARKERS

- Raised pavement markers are to be placed according to the patterns on BC(12).
- All raised pavement markers used for work zone markings shall meet the requirements of Item 672, "RAISED PAVEMENT MARKERS" and Departmental Material Specification DMS-4200 or DMS-4300.

### PREFABRICATED PAVEMENT MARKINGS

- Removable prefabricated pavement markings shall meet the requirements of DMS-8241.
- Non-removable prefabricated pavement markings (foil back) shall meet the requirements of DMS-8240.

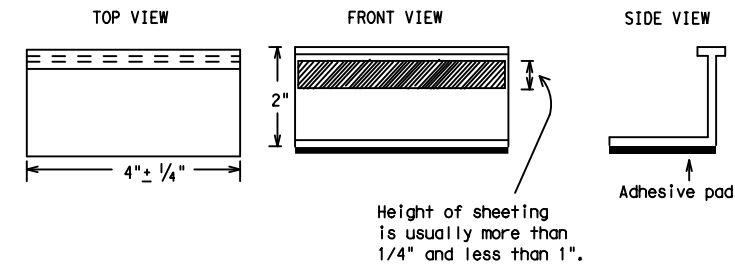
### MAINTAINING WORK ZONE PAVEMENT MARKINGS

- The Contractor will be responsible for maintaining work zone pavement markings within the work limits.
- Work zone pavement markings shall be inspected in accordance with the frequency and reporting requirements of work zone traffic control device inspections as required by Form 599.
- The markings should provide a visible reference for a minimum distance of 300 feet during normal daylight hours and 160 feet when illuminated by automobile low-beam headlights at night, unless sight distance is restricted by roadway geometrics.
- Markings failing to meet this criteria within the first 30 days after placement shall be replaced at the expense of the Contractor as per Specification Item 662.

### REMOVAL OF PAVEMENT MARKINGS

- Pavement markings that are no longer applicable, could create confusion or direct a motorist toward or into the closed portion of the roadway shall be removed or obliterated before the roadway is opened to traffic.
- The above shall not apply to detours in place for less than three days, where flaggers and/or sufficient channelizing devices are used in lieu of markings to outline the detour route.
- Pavement markings shall be removed to the fullest extent possible, so as not to leave a discernable marking. This shall be by any method approved by TxDOT Specification Item 677 for "Eliminating Existing Pavement Markings and Markers".
- The removal of pavement markings may require resurfacing or seal coating portions of the roadway as described in Item 677.
- Subject to the approval of the Engineer, any method that proves to be successful on a particular type pavement may be used.
- Blast cleaning may be used but will not be required unless specifically shown in the plans.
- Over-painting of the markings SHALL NOT BE permitted.
- Removal of raised pavement markers shall be as directed by the Engineer.
- Removal of existing pavement markings and markers will be paid for directly in accordance with Item 677, "ELIMINATING EXISTING PAVEMENT MARKINGS AND MARKERS," unless otherwise stated in the plans.
- Black-out marking tape may be used to cover conflicting existing markings for periods less than two weeks when approved by the Engineer.

## Temporary Flexible-Reflective Roadway Marker Tabs



**STAPLES OR NAILS SHALL NOT BE USED TO SECURE  
TEMPORARY FLEXIBLE-REFLECTIVE ROADWAY MARKER  
TABS TO THE PAVEMENT SURFACE**

- Temporary flexible-reflective roadway marker tabs used as guidemarks shall meet the requirements of DMS-8242.
- Tabs detailed on this sheet are to be inspected and accepted by the Engineer or designated representative. Sampling and testing is not normally required, however at the option of the Engineer, either "A" or "B" below may be imposed to assure quality before placement on the roadway.
  - Select five (5) or more tabs at random from each lot or shipment and submit to the Construction Division, Materials and Pavement Section to determine specification compliance.
  - Select five (5) tabs and perform the following test. Affix five (5) tabs at 24 inch intervals on an asphaltic pavement in a straight line. Using a medium size passenger vehicle or pickup, run over the markers with the front and rear tires at a speed of 35 to 40 miles per hour, four (4) times in each direction. No more than one (1) out of the five (5) reflective surfaces shall be lost or displaced as a result of this test.
- Small design variances may be noted between tab manufacturers.
- See Standard Sheet WZ(STPM) for tab placement on new pavements. See Standard Sheet TCP(7-1) for tab placement on seal coat work.

### RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

- Raised pavement markers used as guidemarks shall be from the approved product list, and meet the requirements of DMS-4200.
- All temporary construction raised pavement markers provided on a project shall be of the same manufacturer.
- Adhesive for guidemarks shall be bituminous material hot applied or butyl rubber pad for all surfaces, or thermoplastic for concrete surfaces.

Guidemarks shall be designated as:  
 YELLOW - (two amber reflective surfaces with yellow body).  
 WHITE - (one silver reflective surface with white body).

DEPARTMENTAL MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
TRAFFIC BUTTONS	DMS-4300
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240
TEMPORARY REMOVABLE, PREFABRICATED PAVEMENT MARKINGS	DMS-8241
TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS	DMS-8242

A list of prequalified reflective raised pavement markers, non-reflective traffic buttons, roadway marker tabs and other pavement markings can be found at the Material Producer List web address shown on BC(1).

SHEET 11 OF 12



## BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

**BC(11)-21**

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11-02 8-14				

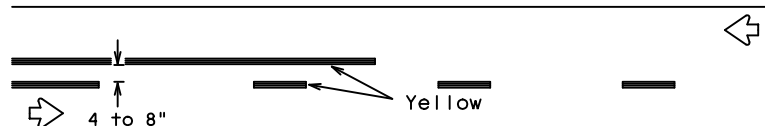
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## PAVEMENT MARKING PATTERNS

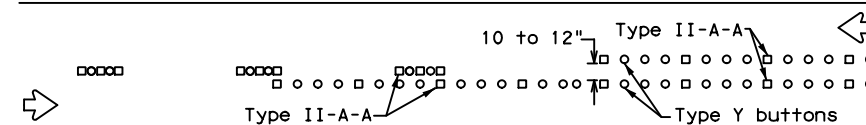


REFLECTORIZED PAVEMENT MARKINGS - PATTERN A

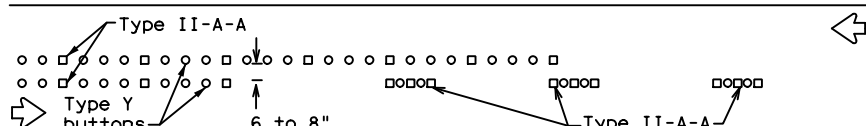


REFLECTORIZED PAVEMENT MARKINGS - PATTERN B

Pattern A is the TXDOT Standard, however Pattern B may be used if approved by the Engineer. Prefabricated markings may be substituted for reflectorized pavement markings.

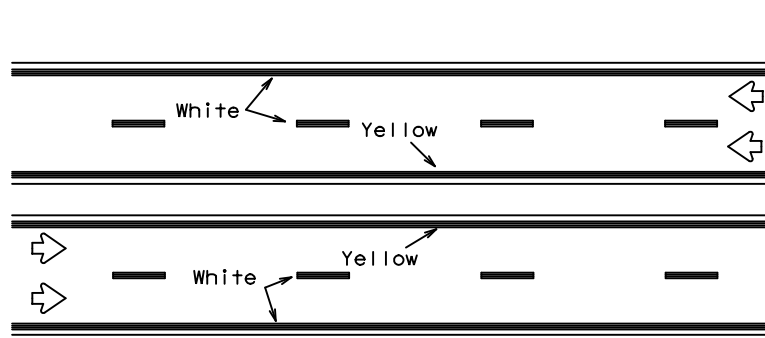


RAISED PAVEMENT MARKERS - PATTERN A



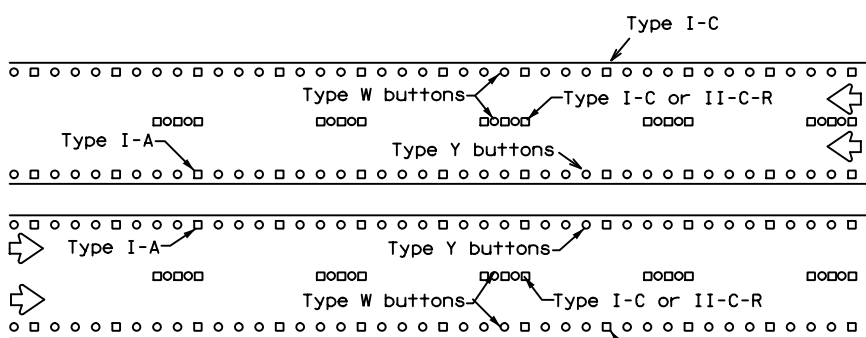
RAISED PAVEMENT MARKERS - PATTERN B

## CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO-LANE, TWO-WAY HIGHWAYS



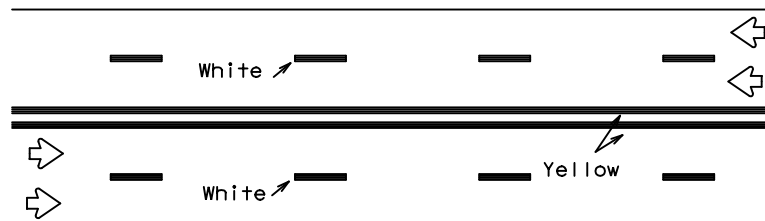
REFLECTORIZED PAVEMENT MARKINGS

Prefabricated markings may be substituted for reflectorized pavement markings.



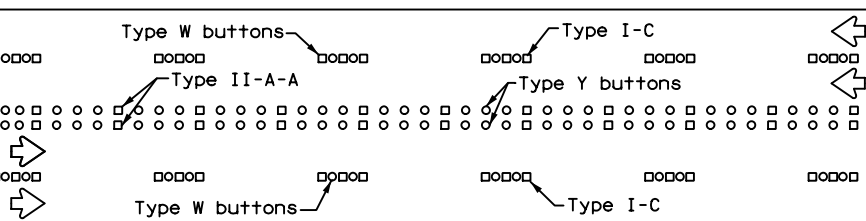
RAISED PAVEMENT MARKERS

## EDGE & LANE LINES FOR DIVIDED HIGHWAY



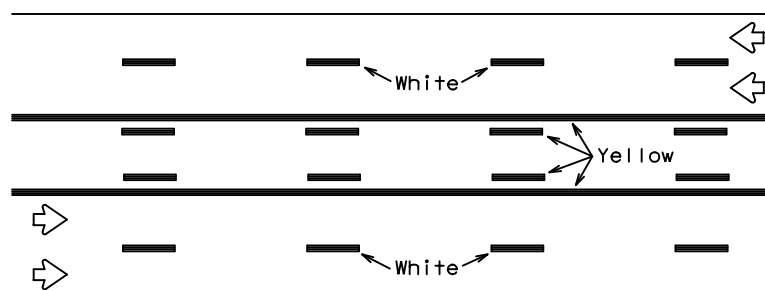
REFLECTORIZED PAVEMENT MARKINGS

Prefabricated markings may be substituted for reflectorized pavement markings.



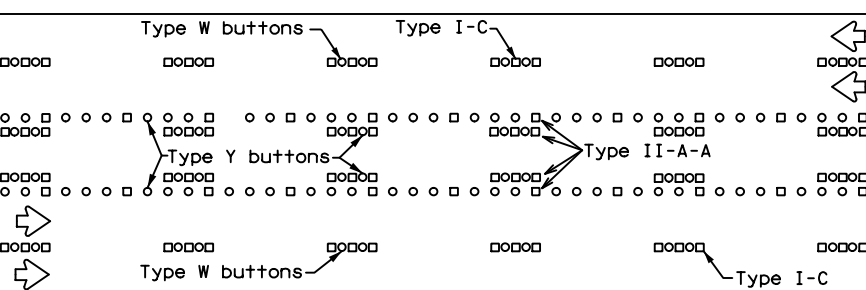
RAISED PAVEMENT MARKERS

## LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS

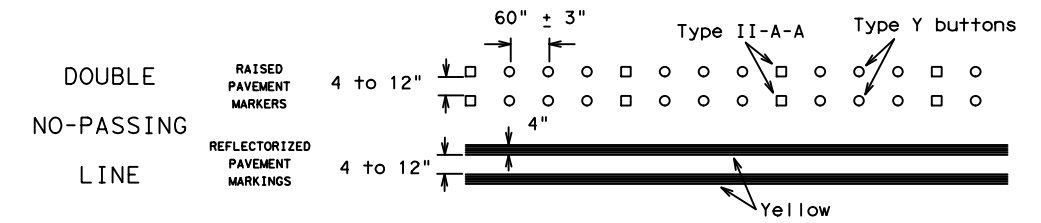
Prefabricated markings may be substituted for reflectorized pavement markings.



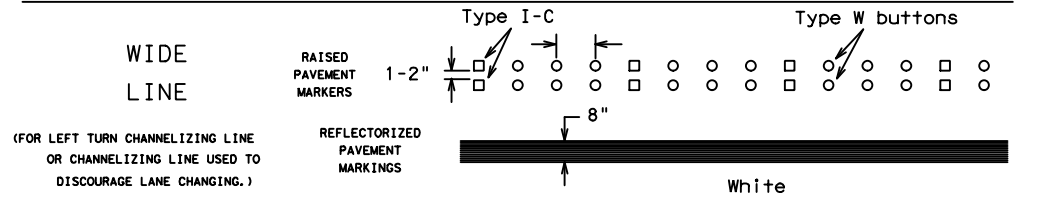
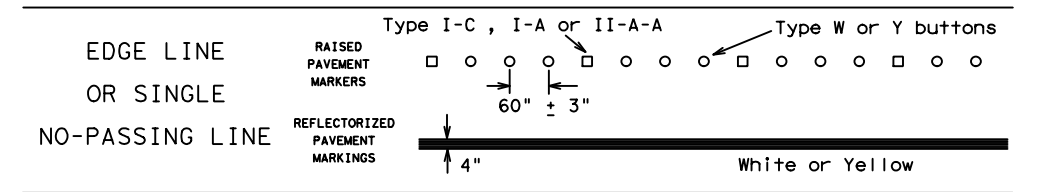
RAISED PAVEMENT MARKERS

## TWO-WAY LEFT TURN LANE

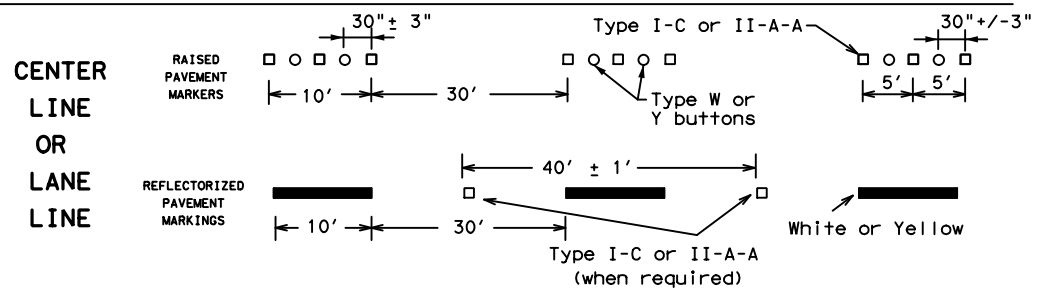
## STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS



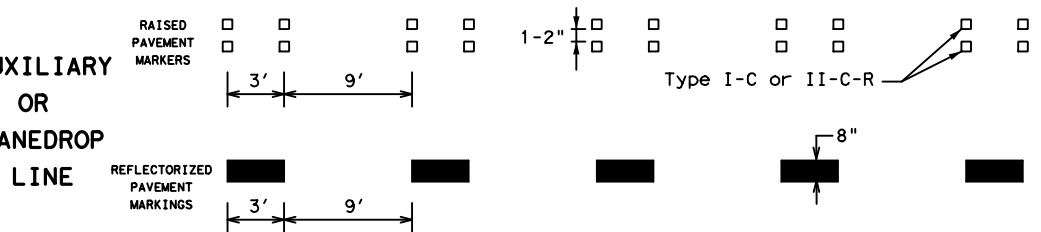
### SOLID LINES



### BROKEN LINES

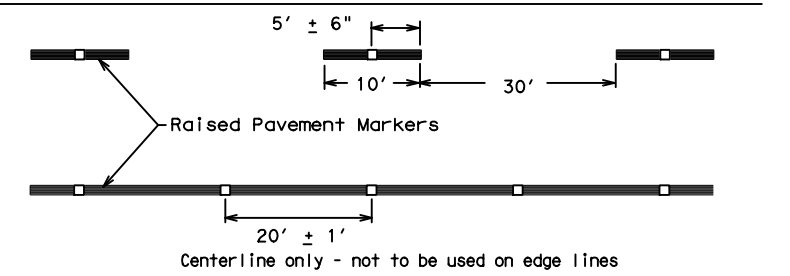


### AUXILIARY OR LANEDROP LINE



### REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

If raised pavement markers are used to supplement REMOVABLE markings, the markers shall be applied to the top of the tape at the approximate mid length of tape used for broken lines or at 20 foot spacing for solid lines. This allows an easier removal of raised pavement markers and tape.



SHEET 12 OF 12



## BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-21

Raised pavement markers used as standard pavement markings shall be from the approved products list and meet the requirements of Item 672 "RAISED PAVEMENT MARKERS."

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CR: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	0923	17	084	CR 392
1-97 9-07 5-21	DIST	COUNTY	SHEET NO.	
2-98 7-13	BWD	COMANCHE	17	
11-02 8-14				

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DATE: 12/19/2023 4:00:13 PM  
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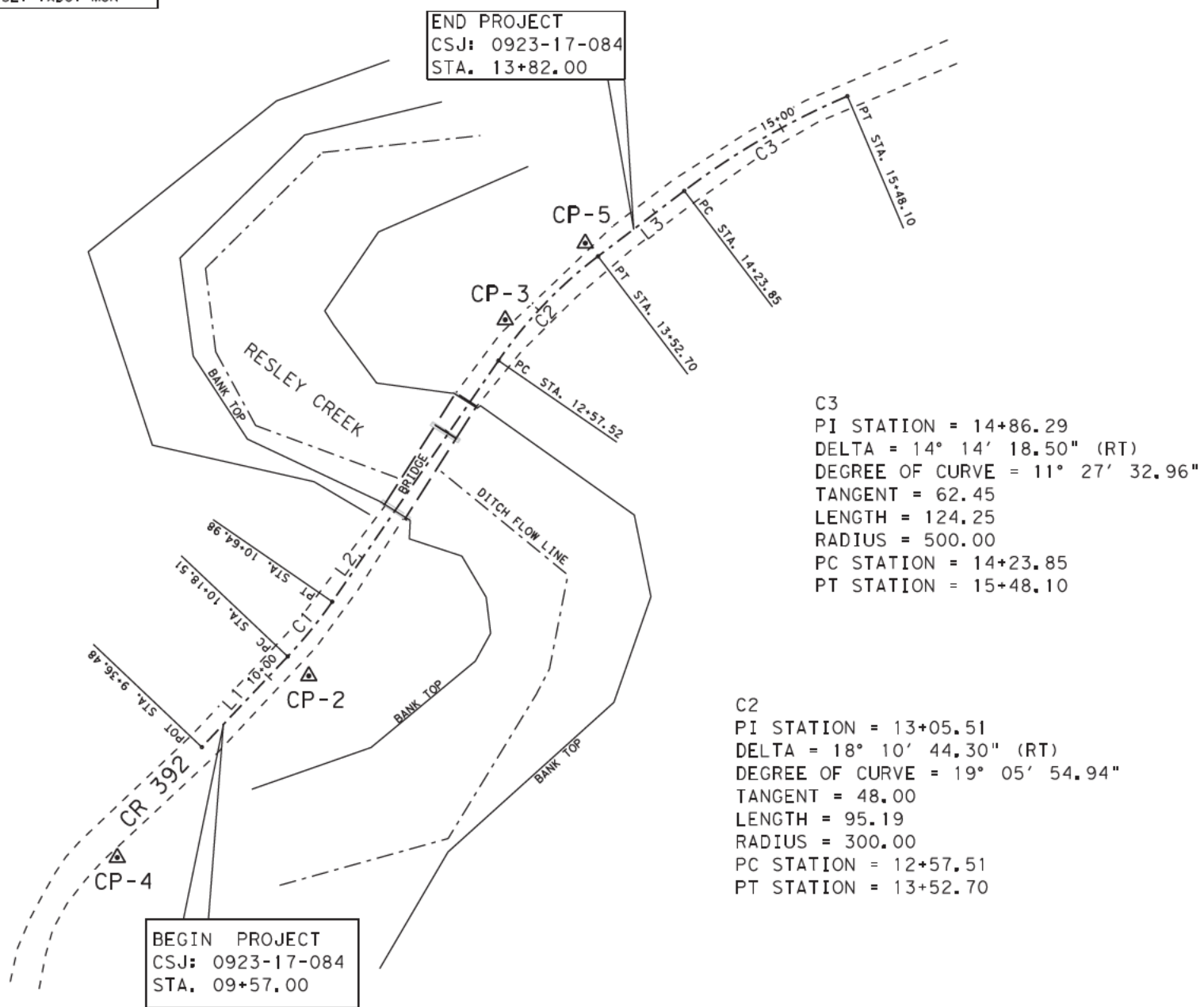
DATE: 12/18/2023 9:07:09 AM  
 FILE: S:\2023\2320055-BWD BRIDGES PGALCADD\CR 392\MRF0923\_17\_084\_CR392@Resley Creek-SCM.dgn

CONTROL MONUMENTATION TABLE						
POINT	STATION	OFFSET	NORTHING (N)	EASTING (E)	ELEV.	DESCRIPTION
CP-2	10+18.77	18.76510	10,641,483.14	2,948,870.84	1066.19'	TXDOT ALLUM CAP
CP-3	12+81.15	-12.53384	10,641,717.25	2,948,999.97	1067.90'	TXDOT ALLUM CAP
CP-5	13+51.28	-11.94163	10,641,767.61	2,949,052.58	1068.30'	SET TXDOT MON

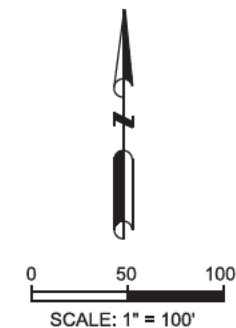
CONTROL MONUMENT INVERSE			
FROM	TO	BEARING	DISTANCE
CP-1	CP-4	N 13° 26' 46" E	1246.26'
CP-4	CP-2	N 46° 29' 41" E	173.49'
CP-2	CP-3	N 28° 52' 48" E	267.36'
CP-3	CP-5	N 46° 15' 13" E	72.82'

LINE DATA		
LINE	BEARING	LENGTH
L1	N 43° 27' 20" E	82.03'
L2	N 34° 34' 48" E	192.54'
L3	N 52° 45' 33" E	71.15'

C1  
 PI STATION = 10+41.79  
 DELTA = 08° 52' 31.36" (LT)  
 DEGREE OF CURVE = 19° 05' 54.94"  
 TANGENT = 23.28  
 LENGTH = 46.47  
 RADIUS = 300.00  
 PC STATION = 10+18.50  
 PT STATION = 10+64.98



- NOTES:
- ALL BEARINGS AND COORDINATES ARE BASED ON THE TEXAS COORDINATE SYSTEM, CENTRAL ZONE (4203), NORTH AMERICAN DATUM OF 1983 (NAD 83), (2011), EPOCH 2010.00. ALL DISTANCES AND COORDINATES SHOWN HEREON ARE SURFACE VALUES AND MAY BE CONVERTED TO GRID BY DIVIDING BY THE SURFACE ADJUSTMENT FACTOR OF 1.00003 FOR COMANCHE COUNTY, TEXAS.
  - HORIZONTAL CONTROL WAS DERIVED FROM MULTIPLE GPS OBSERVATIONS UTILIZING TXDOT RTN (VRS). HORIZONTAL SURVEY METHOD: TXDOT RTN
  - ALL ELEVATIONS HEREON ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).
  - THE ELEVATION OF THE EXISTING PROVIDED TXDOT CONTROL MONUMENT NO. 1 WAS HELD FOR VERTICAL CONTROL (NAVD88, GEOID 18). VERTICAL SURVEY METHOD: DIGITAL LEVELING
  - FIELD SURVEYS WERE PERFORMED BETWEEN JUNE, 2023 AND AUGUST, 2023.
- THE CONTROL POINTS SHOWN HEREIN WERE DETERMINED BY A SURVEY MADE ON THE GROUND UNDER MY SUPERVISION AND REPRESENTS AN UPDATE TO SURVEY CONTROL PREVIOUSLY ESTABLISHED AND PROVIDED BY TXDOT.  
 SURVEY DATE: AUGUST, 2023



THIS SURVEY WAS PERFORMED UNDER MY SUPERVISION.

JACOB J. LUPHER  
 REGISTERED PROFESSIONAL LAND SURVEYOR  
 TEXAS REGISTRATION NO. 6606

12/18/2023  
 REGISTERED PROFESSIONAL LAND SURVEYOR  
 TEXAS REGISTRATION NO. 6606

NO.	DATE	REVISION	APPROV.

**LANDTECH**  
 2525 North Loop West, Suite 300,  
 Houston, Texas 77008  
 T: 713-861-7068 F: 713-861-4131  
 TBPE Registration No. F-3364; TBPLS Registration No. 10019100

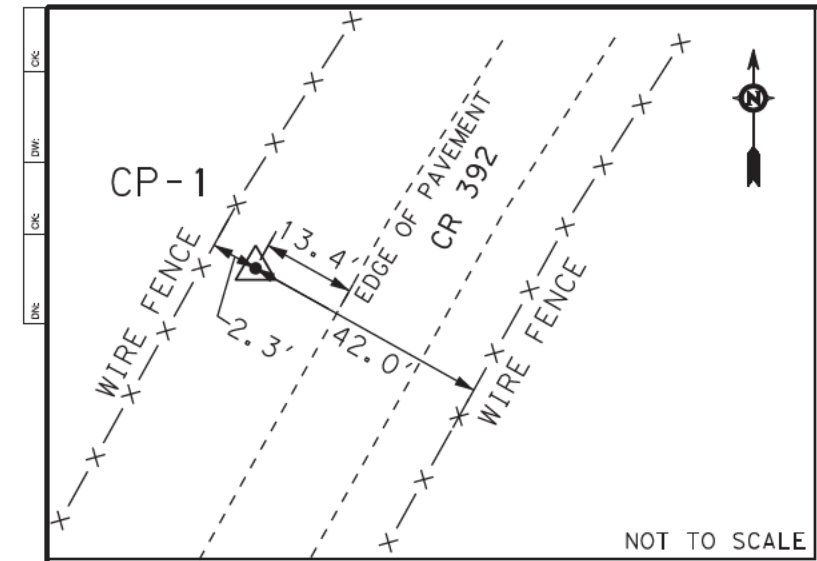
CR 392 @ RESLEY CREEK

## SURVEY CONTROL INDEX

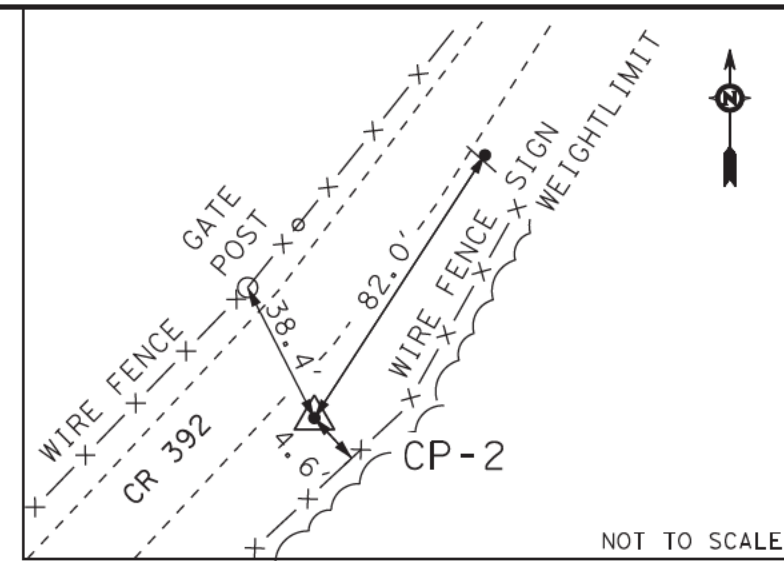
SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0923	17	084	CR 392
DIST		COUNTY	SHEET NO.
BWD		COMANCHE	18

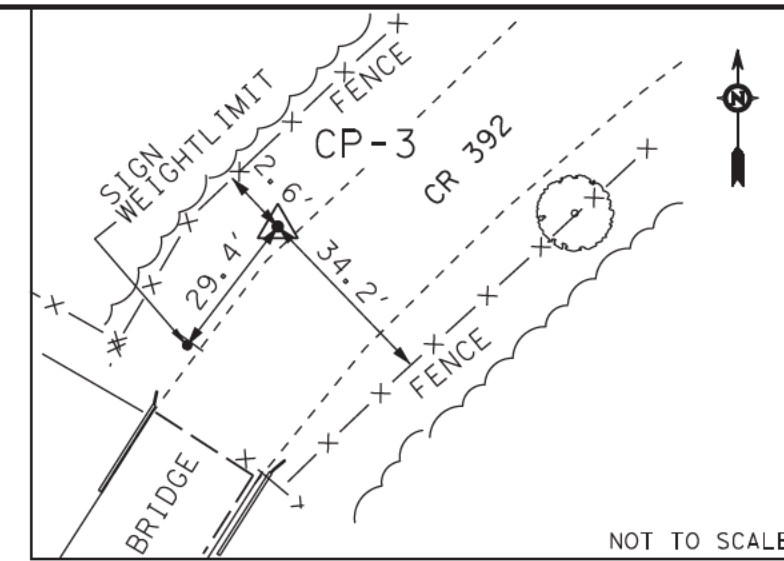
CP-1  
▲



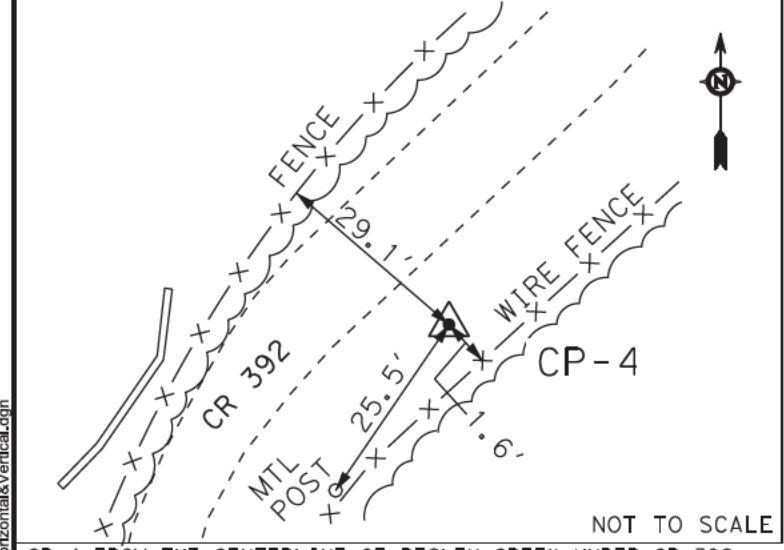
CP-1 FROM THE CENTERLINE OF RESLEY CREEK UNDER CR 392 BRIDGE, TRAVEL SOUTHWESTERLY ALONG CR 392 APPROXIMATELY 1,590 FEET. POINT 1 IS ON THE SOUTHWESTERLY SIDE OF THE ROAD +/- 13.4' FT. WESTERLY FROM THE EDGE OF GRAVEL ROAD



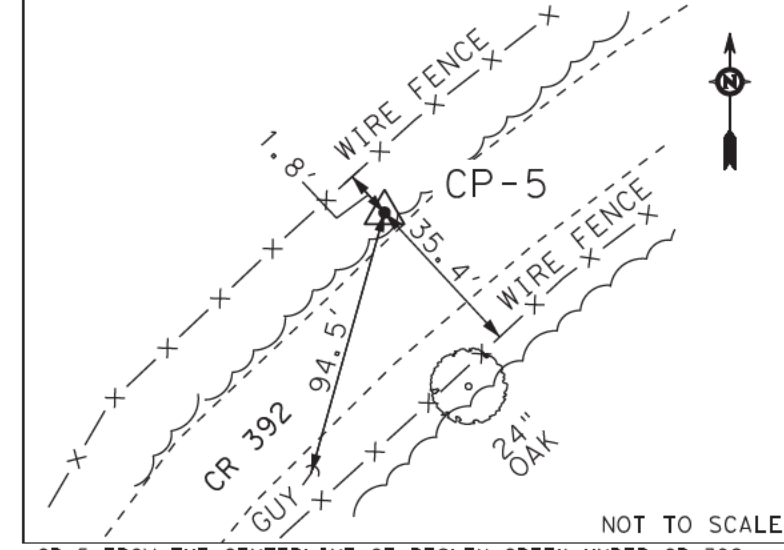
CP-2 FROM THE CENTERLINE OF RESLEY CREEK UNDER CR 392 BRIDGE, TRAVEL SOUTHWESTERLY ALONG CR 392 APPROXIMATELY 148 FEET. POINT 2 IS ON THE SOUTHEASTERLY SIDE OF THE ROAD +/- 9.4 FT. SOUTHEASTERLY FROM THE EDGE OF GRAVEL ROAD.



CP-3 FROM THE CENTERLINE OF RESLEY CREEK UNDER CR 392 BRIDGE, TRAVEL NORTHEASTERLY ALONG CR 392 APPROXIMATELY 112 FEET. POINT 3 IS ON THE NORTHWESTERLY SIDE OF THE ROAD +/- 4.4 FT. NORTHWESTERLY FROM THE EDGE OF GRAVEL ROAD.



CP-4 FROM THE CENTERLINE OF RESLEY CREEK UNDER CR 392 BRIDGE, TRAVEL SOUTHWESTERLY ALONG CR 392 APPROXIMATELY 321 FEET. POINT 4 IS ON THE SOUTHEASTERLY SIDE OF THE ROAD +/- 4.9 FT. SOUTHEASTERLY FROM THE EDGE OF GRAVEL ROAD.



CP-5 FROM THE CENTERLINE OF RESLEY CREEK UNDER CR 392 BRIDGE, TRAVEL NORTHEASTERLY ALONG CR 392 APPROXIMATELY 186 FEET. POINT 5 IS ON THE NORTHWESTERLY SIDE OF THE ROAD +/- 4.5 FT. NORTHWESTERLY FROM THE EDGE OF GRAVEL ROAD.

- NOTES:
1. ALL BEARINGS AND COORDINATES ARE BASED ON THE TEXAS COORDINATE SYSTEM, CENTRAL ZONE (4203), NORTH AMERICAN DATUM OF 1983 (NAD 83), (2011), EPOCH 2010.00. ALL DISTANCES AND COORDINATES SHOWN HEREON ARE SURFACE VALUES AND MAY BE CONVERTED TO GRID BY DIVIDING BY THE SURFACE ADJUSTMENT FACTOR OF 1.00003 FOR COMANCHE COUNTY, TEXAS.
  2. HORIZONTAL CONTROL WAS DERIVED FROM MULTIPLE GPS OBSERVATIONS UTILIZING TXDOT RTN (VRS). HORIZONTAL SURVEY METHOD: TXDOT RTN
  3. ALL ELEVATIONS HEREON ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).
  4. THE ELEVATION OF THE EXISTING PROVIDED TXDOT CONTROL MONUMENT NO. 1 WAS HELD FOR VERTICAL CONTROL (NAVD88, GEOID 18). VERTICAL SURVEY METHOD: DIGITAL LEVELING
  5. FIELD SURVEYS WERE PERFORMED BETWEEN JUNE, 2023 AND AUGUST, 2023.
- THE CONTROL POINTS SHOWN HEREIN WERE DETERMINED BY A SURVEY MADE ON THE GROUND UNDER MY SUPERVISION AND REPRESENTS AN UPDATE TO SURVEY CONTROL PREVIOUSLY ESTABLISHED AND PROVIDED BY TXDOT. SURVEY DATE: AUGUST, 2023

DATE: 12/18/2023 10:51:58 AM  
FILE: S:\2023\2320055-BWD BRIDGES PGALLCADD\CR 392\MRF0923\_17\_084\_CR392@Resley Creek Horizontal&Vertical.dgn

NOT TO SCALE

THIS SURVEY WAS PERFORMED UNDER MY SUPERVISION.

Jacob J. Lupher  
REGISTERED PROFESSIONAL LAND SURVEYOR  
TEXAS REGISTRATION NO. 6606

12/18/2023

NO.	DATE	REVISION	APPROV.

**LANDTECH**  
2525 North Loop West, Suite 300,  
Houston, Texas 77008  
T: 713-861-7068 F: 713-861-4131  
TBPE Registration No. F-1384; TBPLS Registration No. 10019100

CR 392 @ RESLEY CREEK

## HORIZONTAL AND VERTICAL CONTROL

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0923	17	084	CR 392
DIST		COUNTY	SHEET NO.
BWD		COMANCHE	19

DATE: 12/19/2023 4:00:15 PM  
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CK:  
 DW:  
 CK:  
 DW:

HORIZONTAL ALIGNMENT REPORT

Alignment name: CR 392  
 Alignment description: Centerline of CR 392  
 Report Created: Monday, October 9, 2023  
 Time: 2:55:00 PM

	STATION	X	Y
POT	9+36.48 R1	2948800.612	10641436.300
PC	10+18.50 R1	2948857.031	10641495.850
Tangential Direction:	N43°27'19.56"E		
Tangential Length:	82.03		
PC	10+18.50 R1	2948857.031	10641495.850
PI	10+41.79 R1	2948873.044	10641512.750
CC		2948639.258	10641702.180
PT	10+64.98 R1	2948886.258	10641531.920
Radius:	300		
Delta:	08°52'31.36" Left		
Degree of Curvature(Arc):	19°05'54.94"		
Length:	46.47		
Tangent:	23.28		
Chord:	46.42		
Middle Ordinate:	0.9		
External:	0.9		
Tangent Back Direction:	N43°27'19.56"E		
Radial Direction:	S46°32'40.44"E		
Chord Direction:	N39°01'03.88"E		
Radial Direction:	S55°25'11.80"E		
Tangent Ahead Direction:	N34°34'48.20"E		
PT	10+64.98 R1	2948886.258	10641531.920
PC	12+57.51 R1	2948995.534	10641690.440
Tangential Direction:	N34°34'48.20"E		
Tangential Length:	192.54		
PC	12+57.51 R1	2948995.534	10641690.440
PI	13+05.51 R1	2949022.774	10641729.960
CC		2949242.534	10641520.170
PT	13+52.70 R1	2949060.983	10641759.000
Radius:	300		
Delta:	18°10'44.30" Right		
Degree of Curvature(Arc):	19°05'54.94"		
Length:	95.18		
Tangent:	48		
Chord:	94.79		
Middle Ordinate:	3.77		
External:	3.82		
Tangent Back Direction:	N34°34'48.20"E		
Radial Direction:	S55°25'11.80"E		
Chord Direction:	N43°40'10.35"E		
Radial Direction:	S37°14'27.50"E		
Tangent Ahead Direction:	N52°45'32.50"E		
PT	13+52.70 R1	2949060.983	10641759.000
PC	14+23.85 R1	2949117.624	10641802.060
Tangential Direction:	N52°45'32.50"E		
Tangential Length:	71.15		

PC	14+23.85 R1	2949117.624	10641802.060
PI	14+86.29 R1	2949167.340	10641839.850
CC		2949420.209	10641404.010
PT	15+48.10 R1	2949224.823	10641864.250
Radius:	500		
Delta:	14°14'18.50" Right		
Degree of Curvature(Arc):	11°27'32.96"		
Length:	124.25		
Tangent:	62.45		
Chord:	123.93		
Middle Ordinate:	3.85		
External:	3.88		
Tangent Back Direction:	N52°45'32.50"E		
Radial Direction:	S37°14'27.50"E		
Chord Direction:	N59°52'41.75"E		
Radial Direction:	S23°00'09.00"E		
Tangent Ahead Direction:	N66°59'51.00"E		
PT	15+48.10 R1	2949224.823	10641864.250
POT	16+22.79 R1	2949293.572	10641893.440
Tangential Direction:	N66°59'51.00"E		
Tangential Length:	74.69		

NOT TO SCALE

Luis A. González

NO.	DATE	REVISION	APPROV.



**PGAL** 3131 Briarpark Dr, Suite 200  
 Houston, Texas 77042  
 (713) 622-1444  
 TBPE REG. NO. F-2742

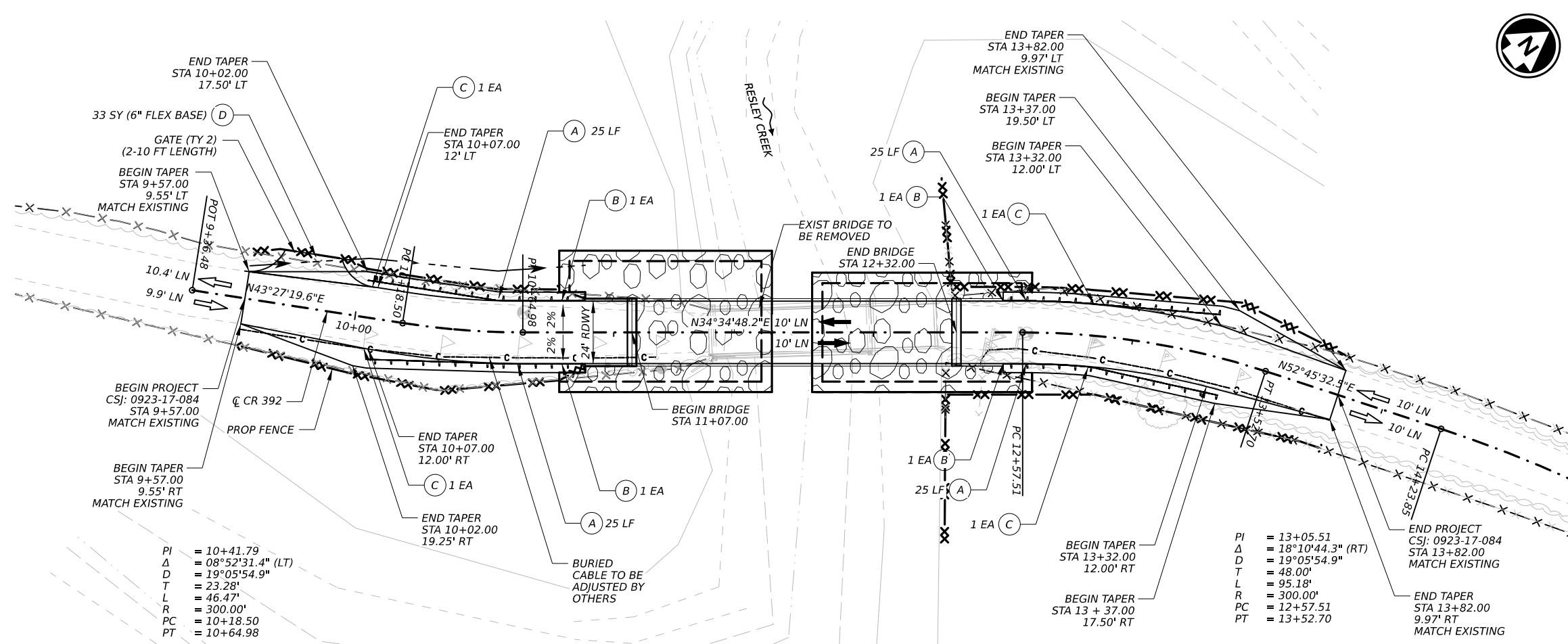
CR392 @ RESLEY CREEK

HORIZONTAL ALIGNMENT DATA

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0923	17	084	CR 392
DIST	COUNTY	SHEET NO.	
BWD	COMANCHE	20	

DATE: 12/19/2023 4:00:22 PM  
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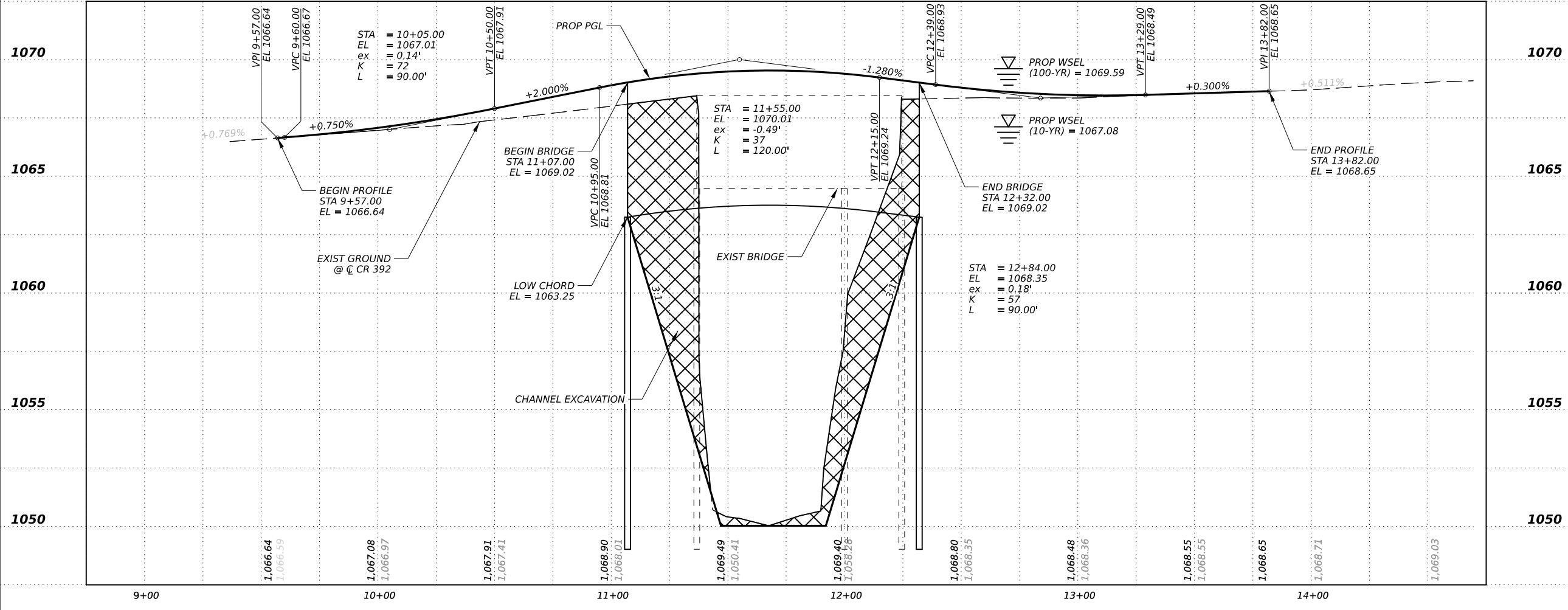


**LEGEND**

- ➔ PROPOSED TRAFFIC FLOW DIRECTION
- ➔ EXISTING TRAFFIC FLOW DIRECTION
- (A) MBGF
- (B) MBGF TRANS (TL-2)
- (C) SGT
- (D) DRIVEWAY (BASE)
- ➔ DITCH FLOW DIRECTION
- STONE RIPRAP

**SECTION A-A**

DRIVEWAY NOTES:  
 1. GRADE VALLEY TO DRAIN FROM SOUTH EDGE TOWARDS NORTH EDGE



12/19/2023

**Luis A. González**  
 104983  
 LICENSED PROFESSIONAL ENGINEER

NO.	DATE	REVISION	APPROV.

**Texas Department of Transportation**

**PG&A** 3131 Briarpark Dr, Suite 200  
 Houston, Texas 77042  
 (713) 622-1444

CR 392 @ RESLEY CREEK

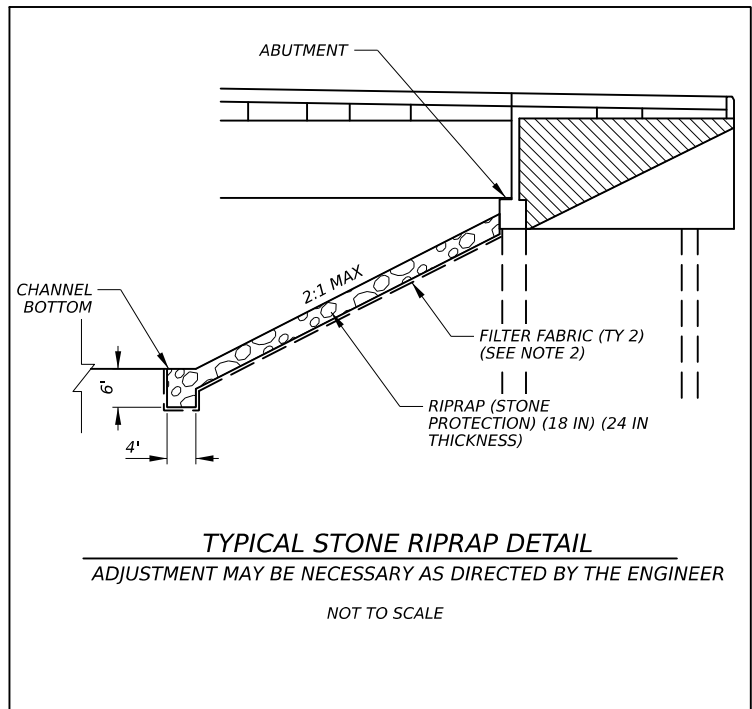
**ROADWAY  
 PLAN & PROFILE**

SHEET 1 OF 1

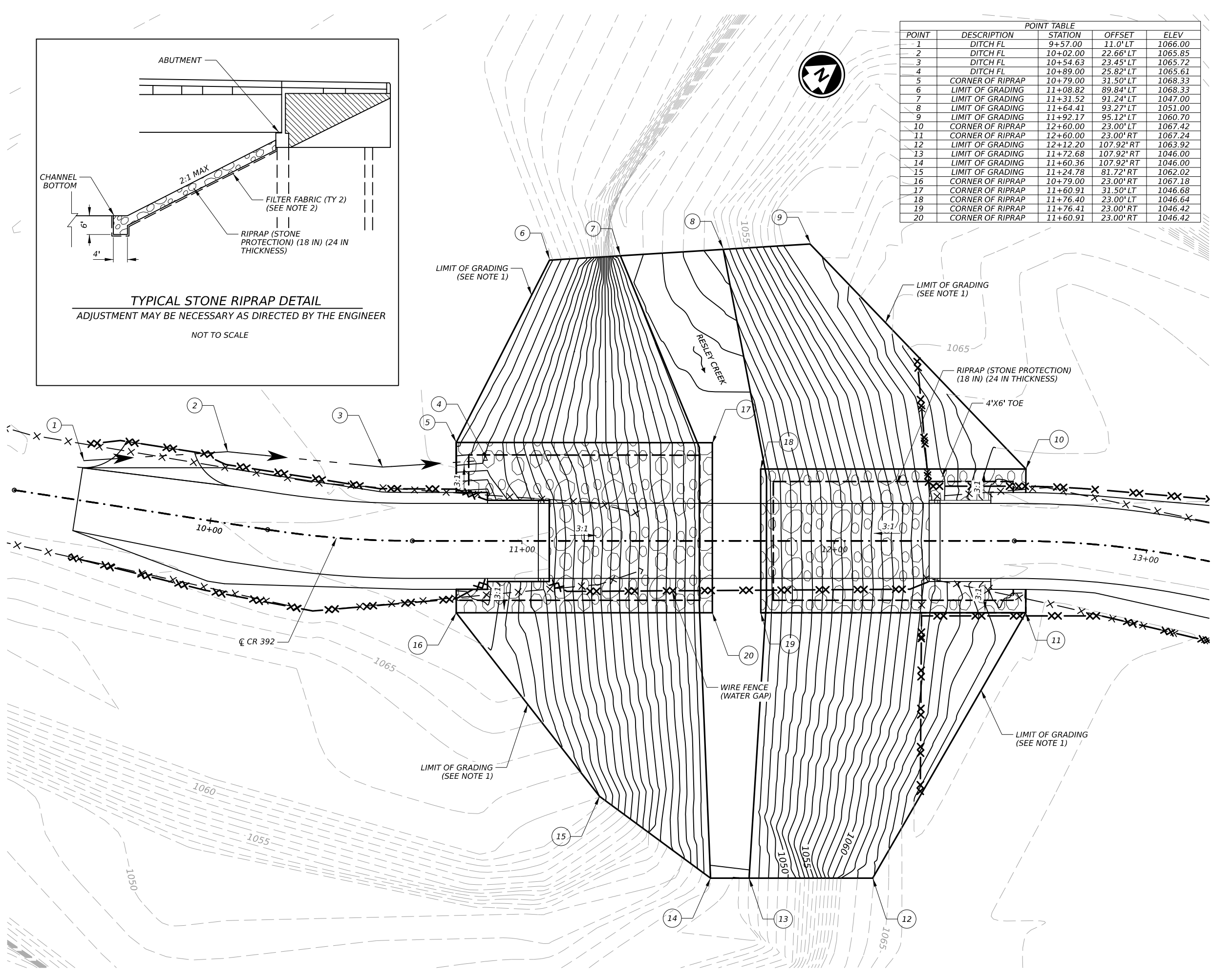
CONT	SECT	JOB	HIGHWAY
0923	17	084	CR 392
DIST	COUNTY	SHEET NO.	
BWD	COMANCHE	21	

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DW:  
CK:  
DW:

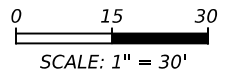
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POINT	DESCRIPTION	STATION	OFFSET	ELEV
1	DITCH FL	9+57.00	11.0' LT	1066.00
2	DITCH FL	10+02.00	22.66' LT	1065.85
3	DITCH FL	10+54.63	23.45' LT	1065.72
4	DITCH FL	10+89.00	25.82' LT	1065.61
5	CORNER OF RIPRAP	10+79.00	31.50' LT	1068.33
6	LIMIT OF GRADING	11+08.82	89.84' LT	1068.33
7	LIMIT OF GRADING	11+31.52	91.24' LT	1047.00
8	LIMIT OF GRADING	11+64.41	93.27' LT	1051.00
9	LIMIT OF GRADING	11+92.17	95.12' LT	1060.70
10	CORNER OF RIPRAP	12+60.00	23.00' LT	1067.42
11	CORNER OF RIPRAP	12+60.00	23.00' RT	1067.24
12	LIMIT OF GRADING	12+12.20	107.92' RT	1063.92
13	LIMIT OF GRADING	11+72.68	107.92' RT	1046.00
14	LIMIT OF GRADING	11+60.36	107.92' RT	1046.00
15	LIMIT OF GRADING	11+24.78	81.72' RT	1062.02
16	CORNER OF RIPRAP	10+79.00	23.00' RT	1067.18
17	CORNER OF RIPRAP	11+60.91	31.50' LT	1046.68
18	CORNER OF RIPRAP	11+76.40	23.00' LT	1046.64
19	CORNER OF RIPRAP	11+76.41	23.00' RT	1046.42
20	CORNER OF RIPRAP	11+60.91	23.00' RT	1046.42



- NOTES**
- BRUSH REMOVAL AND TREE REMOVAL REQUIRED FOR CLEARING AREAS WITHIN THE GRADING LIMITS OF THE PROJECT ARE CONSIDERED SUBSIDIARY TO BID ITEM 100 "PREPARING ROW."
  - FILTER FABRIC IS SUBSIDIARY TO ITEM 432.



STATE OF TEXAS  
Luis A. González  
104983  
LICENSED PROFESSIONAL ENGINEER  
1/22/2024  
*Luis A. González*

NO.	DATE	REVISION	APPROV.

Texas Department of Transportation  
3131 Briarpark Dr, Suite 200  
Houston, Texas 77042  
(713) 622-1444

PGAL  
CR392 @ RESLEY CREEK  
**RIPRAP, GRADING & FENCE LAYOUT**

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0923	17	084	CR 392
DIST	COUNTY	SHEET NO.	
BWD	COMANCHE	22	

DATE: 12/19/2023 4:00:24 PM  
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REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS				DELINEATORS				D & OM DESCRIPTIVE CODES	
DEVICE	SIZE 1	SIZE 2	SIZE 3	SIZE 4	DEVICE	SINGLE	DOUBLE	INSTL DEL ASSM (D-XX)SZ X (XXXX)XXX (XX)	
								NUMBER OF REFLECTORS S = Single D = Double COLOR OF REFLECTORS W = White Y = Yellow R = Red REFLECTOR UNIT SIZE 1 or 2 TYPE OF POST OR DELINEATOR WC = Wing Channel Post YFLX = Yellow Flexible Post WFLX = White Flexible Post BRF = Barrier Reflector TYPE OF MOUNT GND = Embedded (drivable or set in concrete) CTB = Concrete Barrier Mount GF1 or GF2 = Guard Fence Attachment SRF = Surface Mount DIRECTION If Required BI = Bi-Directional BR = Bi-Directional with red on back	
SHEETING	Yellow, White or Red Type B or C reflective sheeting				SHEETING	Yellow, White or Red Type B or C Reflective Sheeting			
NOTE	1. Size 1 and 4 - Direct applied reflective sheeting for use on flexible post (fix). 2. Size 2 and 3 - For use on wing channel (wc) post only. Use approved metal, plastic or fiberglass backplate with 17/64" mounting holes.				POST TYPE	WC	YFLX, WFLX	WC	YFLX, WFLX
					MOUNT TYPE	GND	GND, SRF	GND	GND, SRF

OBJECT MARKERS								INSTL OM ASSM (OM-XX) (XXXX)XXX (XX)		
DEVICE	Type 1 (OM-1)	Type 2 (OM-2)			Type 3 (OM-3)			Type 4 (OM-4)	TYPE OF OBJECT MARKER 1, 2, 3, or 4 NUMBER OF REFLECTORS OR DIRECTION X = 3-Size 2 reflector units (Type 2 only) Y = 1-Size 3 reflector unit (Type 2 only) Z = 3-Size 1 or 1-Size 4 reflector unit(s) (Type 2 only) L = Left Side (Type 3 Object Marker only) R = Right Side (Type 3 Object Marker only) C = Center (Type 3 Object Marker only) TYPE OF POST WC = Wing Channel Post WFLX = White Flexible Post TWT = Thin Walled Tubing TYPE OF MOUNT GND = Embedded (drivable) SRF = Surface Mount WAS = Wedge Anchor Steel WAP = Wedge Anchor Plastic DIRECTION If Required BI = Bi-Directional	
		OM-1	OM-2X	OM-2Y	OM-2Z	OM-3L	OM-3R	OM-3C	OM-4	
SHEETING	Yellow-Type B <sub>FL</sub> or C <sub>FL</sub> Sheeting	Yellow - Type B or C Sheeting			Alternating acrylic black and retroreflective yellow - Type B <sub>FL</sub> or C <sub>FL</sub> Sheeting			Red -Type B <sub>FL</sub> or C <sub>FL</sub> Sheeting		
POST TYPE	TWT	WC	WC	WFLX	TWT			TWT		
MOUNT TYPE	WAS, WAP	GND	GND	GND, SRF	WAS, WAP			WAS, WAP		

DEPARTMENTAL MATERIAL SPECIFICATIONS	
FLEXIBLE DELINEATOR & OBJECT MARKER POSTS (EMBEDDED & SURFACE MOUNT TYPES)	DMS-4400
SIGN FACE MATERIALS	DMS-8300
DELINEATORS, OBJECT MARKERS AND BARRIER REFLECTORS	DMS-8600

BARRIER REFLECTORS (BRF)			CHEVRONS				ONE DIRECTION LARGE ARROW		NOTE: Delineator and object marker substrates and sign substrates shall be 0.080" Aluminum sign blank to conform to ASTM B-209 Alloy 6061-T6 or approved alternative.		
DEVICE	GF1	GF2	CTB	W1-8				W1-6			
	1. Barrier reflectors shall meet the requirements of DMS 8600. 2. Approved Barrier Reflectors are listed on the "Barrier Reflectors" Material Producer List at: www.txdot.gov.			SIZE (W x L)	18" x 24" (Conventional)	24" x 30" (Conventional Oversize)	30" x 36" (Expressway)	36" x 48" (Freeway)	SIZE (W x L)	48" x 24" (Conventional)	60" x 30" (Expressway & Freeway)
				MOUNTING HEIGHT	4'-0" or 7'-0"		7'-0" Only		MOUNTING HEIGHT	7'-0"	
				NOTE	1. CHEVRON (W1-8) signs and ONE DIRECTION LARGE ARROW (W1-6) Signs shall be installed per Sign Mounting Details (SMD) Standard Sheets and paid under Item 644 (Small Roadside Sign Assemblies). 2. When there is a need to increase conspicuity, the Texas version of the ONE DIRECTION LARGE ARROW sign (W1-9T) may be used instead of the ONE DIRECTION LARGE ARROW (W1-6).						
SHEETING	Yellow, White, Red										
NOTE	1. Reflective sheeting shall have a minimum dimension of 3 inches and minimum surface area of 9 square inches.										

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### DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION

#### D & OM(1)-20

FILE: dom1-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CR: TXDOT
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10-09 3-15	DIST	COUNTY	SHEET NO.	
4-10 7-20	BWD	COMANCHE	23	

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POST TYPE AND SUPPORT FOUNDATION DETAILS				TYPE OF BARRIER MOUNTS		
WING CHANNEL (WC)	FLEXIBLE POSTS (YFLX, WFLX)		WEDGE ANCHOR SYSTEMS		GUARD FENCE ATTACHMENT	
GND	GND	SRF	WAS	WAP	GF1	
	EMBEDDED	SURFACE MOUNT	STEEL	PLASTIC	GF2	
<b>NOTES</b> 1. Embedded Wing Channel (WC) post option may be used for Type 2 Object Markers and Delineators only. 2. 1.12 lbs/ft steel per ASTM A 1011 SS Gr. 50, or ASTM A499.		<b>NOTES</b> 1. See "Flexible Delineator and Object Marker Posts" Material Producer List for approved devices. 2. Install per manufacturer's recommendations. 3. Post length may vary to meet field conditions. 4. When using yellow delineators with flexible posts to separate opposing direction of travel, such as centerline or median use, the flexible posts shall be yellow.		<b>NOTE</b> 1. Install per manufacturer's recommendations.		
				<b>CONCRETE TRAFFIC BARRIER (CTB)</b> 		
				<b>GENERAL NOTES</b> 1. Place delineators on a section of roadway at a consistent distance from the edge of pavement. 2. Where a restriction prevents consistent placement from the pavement edge, place the affected object markers in line with the innermost edge of the obstruction. 3. When Type 2 object markers and delineators are more than 8'-0" from the edge of the pavement, it may not be possible to maintain a height of approximately 4'-0". If this is the case, place the object marker or delineator as close to the desired height as possible. 4. Install all delineators, object markers and barrier reflectors in accordance with the manufacturer's recommendation. 5. Barrier reflectors should be installed a minimum of 18 inches above the edge of the pavement surface. 6. Diagonal stripes on Type 3 object markers shall slope down toward the intended travel lane.		
<b>TYPES 1,3, AND 4 OBJECT MARKERS AND CHEVRONS</b> 		<b>CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN</b> 		<b>DELINEATORS AND TYPE 2 OBJECT MARKERS</b> 		
<b>NOTE</b> Mounting at 4 feet to the bottom of the chevron is permitted for chevrons that will not exceed a height of 6'-6" to the top of the chevron (sizes 24" x 30" and smaller)		<b>NOTE</b> Chevrons 30" x 36" and larger shall be mounted at a height of 7' to the bottom of the chevron. Chevron sign and ONE DIRECTION LARGE ARROW sign (W1-9T) shall be installed per SMD standard sheets and paid under item 644.		See general notes 1, 2 and 3.		

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Traffic Safety Division Standard

## DELINEATOR & OBJECT MARKER INSTALLATION

### D & OM(2)-20

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REVISIONS	0923	17	084	CR 392
10-09 3-15	DIST	COUNTY	SHEET NO.	
4-10 7-20	BWD	COMANCHE	24	



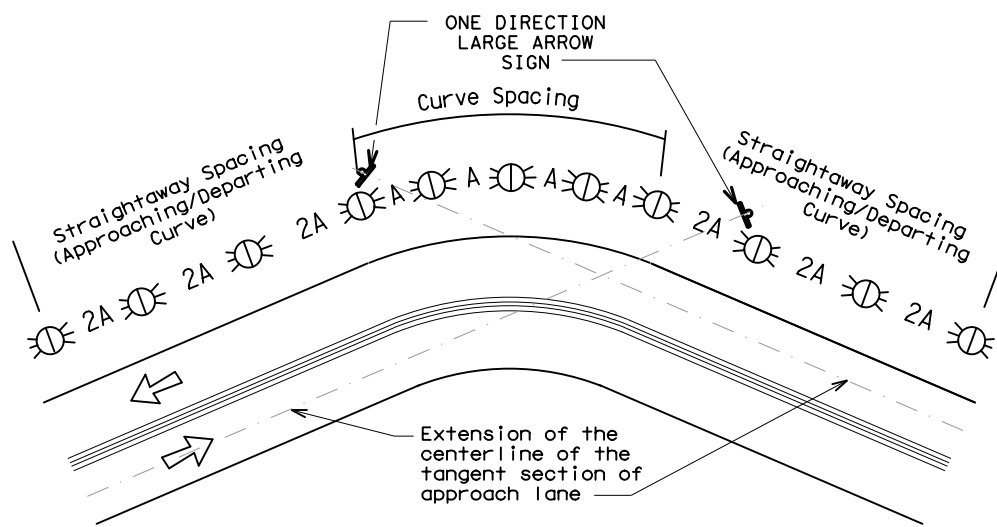
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### MINIMUM WARNING DEVICES AT CURVES WITH ADVISORY SPEEDS

Amount by which Advisory Speed is less than Posted Speed	Curve Advisory Speed	
	Turn (30 MPH or less)	Curve (35 MPH or more)
5 MPH & 10 MPH	• RPMs	• RPMs
15 MPH & 20 MPH	• RPMs and One Direction Large Arrow sign	• RPMs and Chevrons; or • RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons.
25 MPH & more	• RPMs and Chevrons; or • RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons	• RPMs and Chevrons

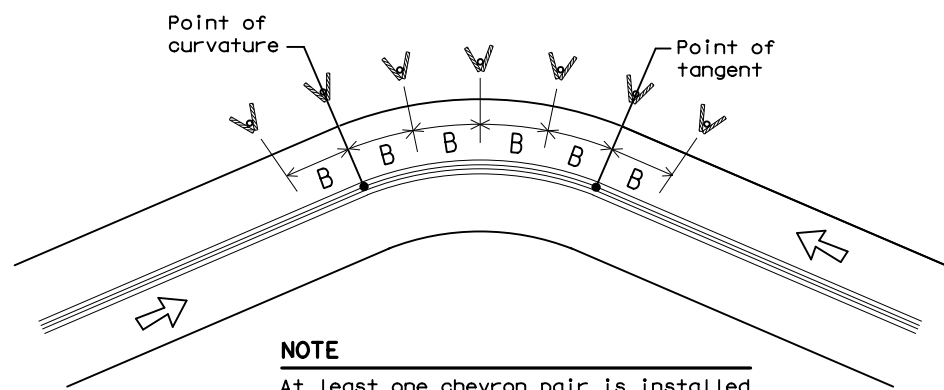
### SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



**NOTE**

ONE DIRECTION LARGE ARROW (W1-6) sign should be located at approximately and perpendicular to the extension of the centerline of the tangent section of approach lane.

### SUGGESTED SPACING FOR CHEVRONS ON HORIZONTAL CURVES



**NOTE**

At least one chevron pair is installed beyond the point of tangent in tangent section.

### DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS KNOWN				
Degree of Curve	FEET			
	Radius of Curve	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
		A	2A	B
1	5730	225	450	—
2	2865	160	320	—
3	1910	130	260	200
4	1433	110	220	160
5	1146	100	200	160
6	955	90	180	160
7	819	85	170	160
8	716	75	150	160
9	637	75	150	120
10	573	70	140	120
11	521	65	130	120
12	478	60	120	120
13	441	60	120	120
14	409	55	110	80
15	382	55	110	80
16	358	55	110	80
19	302	50	100	80
23	249	40	80	80
29	198	35	70	40
38	151	30	60	40
57	101	20	40	40

Curve delineator approach and departure spacing should include 3 delineators spaced at 2A. This spacing should be used during design preparation or when the degree of curve is known.

### DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS NOT KNOWN			
Advisory Speed (MPH)	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
	A	2xA	B
65	130	260	200
60	110	220	160
55	100	200	160
50	85	170	160
45	75	150	120
40	70	140	120
35	60	120	120
30	55	110	80
25	50	100	80
20	40	80	80
15	35	70	40

If the degree of curve is not known, delineator spacing may be determined based on the Advisory Speed of the curve. Use the delineator curve spacing for each Advisory Speed (MPH).

### DELINEATOR AND OBJECT MARKER APPLICATION AND SPACING

CONDITION	REQUIRED TREATMENT	MINIMUM SPACING
Frwy./Exp. Tangent	RPMs	See PM-series and FPM-series standard sheets
Frwy./Exp. Curve	Single delineators on right side	See delineator spacing table
Frwy/Exp. Ramp	Single delineators on at least one side of ramp (should be on outside of curves) (see Detail 3 on D&OM(4))	100 feet on ramp tangents Use delineator spacing table for ramp curves ("straightway spacing" does not apply to ramp curves)
Acceleration/Deceleration Lane	Double delineators (see Detail 3 on D&OM(4))	100 feet (See Detail 3 on D & OM (4))
Truck Escape Ramp	Single red delineators on both sides	50 feet
Bridge Rail (steel or concrete) and Metal Beam Guard Fence	Bi-Directional Delineators when undivided with one lane each direction Single Delineators when multiple lanes each direction	Equal spacing (100' max) but not less than 3 delineators
Concrete Traffic Barrier (CTB) or Steel Traffic Barrier	Barrier reflectors matching the color of the edge line	Equal spacing 100' max
Cable Barrier	Reflectors matching the color of the edge line	Every 5th cable barrier post (up to 100' max)
Guard Rail Terminus/Impact Head	Divided highway - Object marker on approach end Undivided 2-lane highways - Object marker on approach and departure end	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5) and D & OM (6)
Bridges with no Approach Rail	Type 3 Object Marker (OM-3) at end of rail and 3 single delineators approaching rail	See D & OM(5)
Reduced Width Approaches to Bridge Rail	Type 2 and Type 3 Object Markers (OM-3) and 3 single delineators approaching bridge	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5)
Culverts without MBGF	Type 2 Object Markers	See Detail 2 on D & OM(4)
Crossovers	Double yellow delineators and RPMs	See Detail 1 on D & OM (4)
Pavement Narrowing (lane merge) on Freeways/Expressway	Single delineators adjacent to affected lane for full length of transition	100 feet

**NOTES**

- Unless indicated otherwise, the delineator or barrier reflector color shall conform to the color of the pavement edge line on the side of the road where the delineators or barrier reflectors are placed.
- Barrier reflectors may be used to replace required delineators.
- Single red delineators may be mounted on the back side of delineator posts for wrong way driver applications

LEGEND	
	Bi-directional Delineator
	Delineator
	Sign

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## DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

### D & OM(3)-20

FILE: dom3-20.dgn	DW: TXDOT	CK: TXDOT	OW: TXDOT	CR: TXDOT
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REVISIONS	0923	17	084	CR 392
3-15 8-15	DIST	COUNTY	SHEET NO.	
8-15 7-20	BWD	COMANCHE	<b>25</b>	

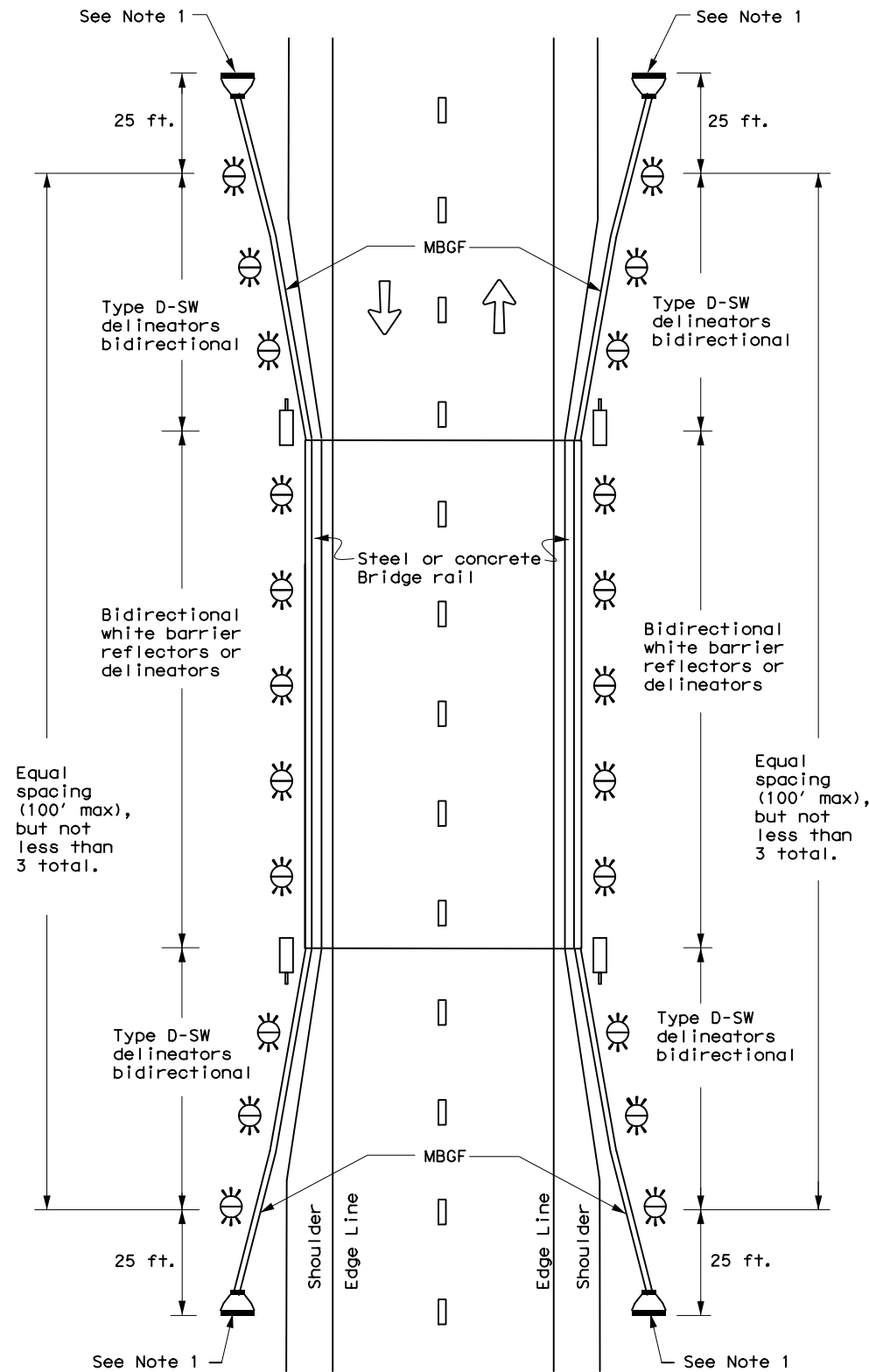
**TWO-WAY, TWO LANE ROADWAY  
WITH REDUCED WIDTH APPROACH RAIL**

**TWO-WAY, TWO LANE ROADWAY  
WITH METAL BEAM GUARD FENCE (MBGF)**

**TWO-WAY, TWO LANE ROADWAY  
BRIDGE WITH NO APPROACH RAIL**

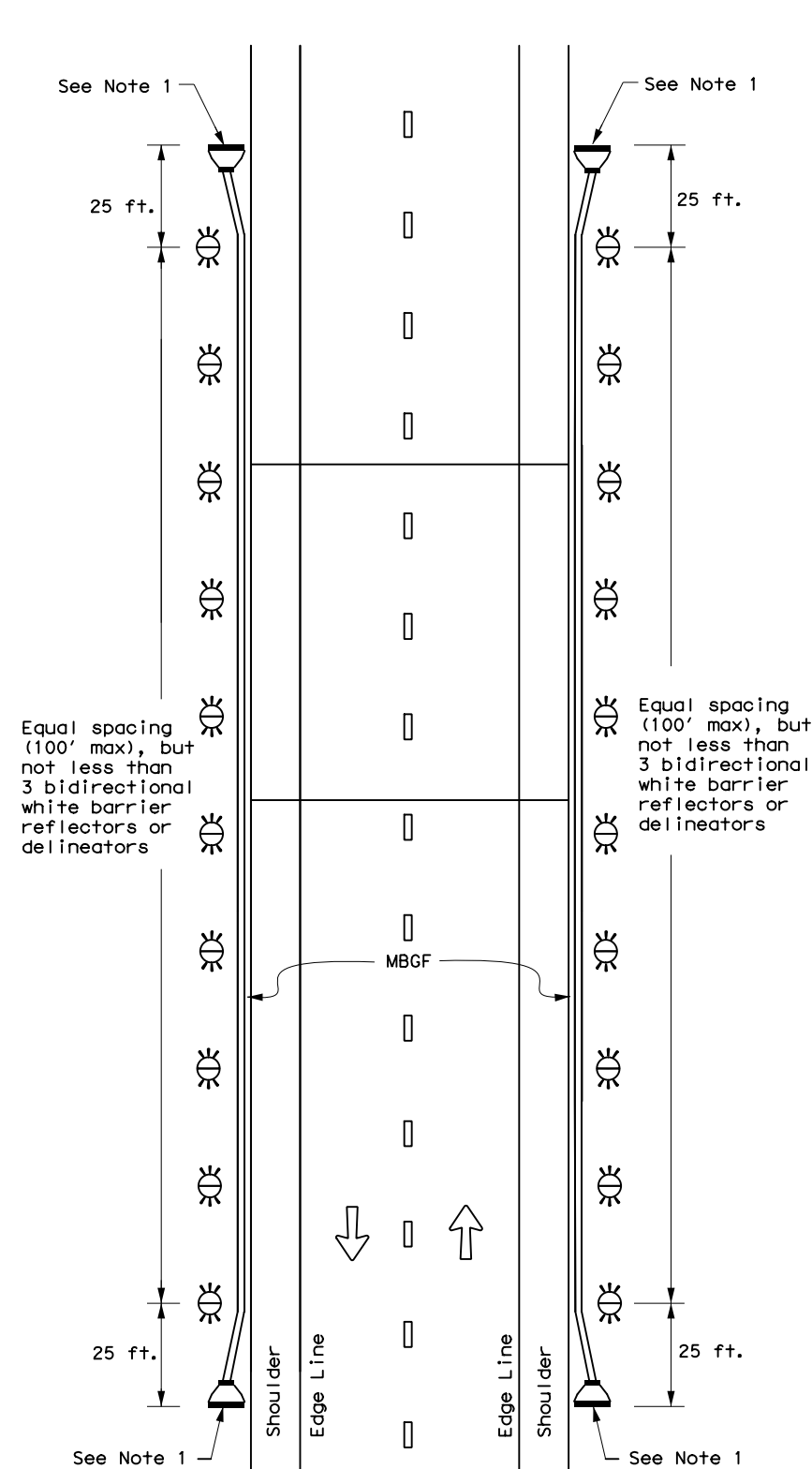
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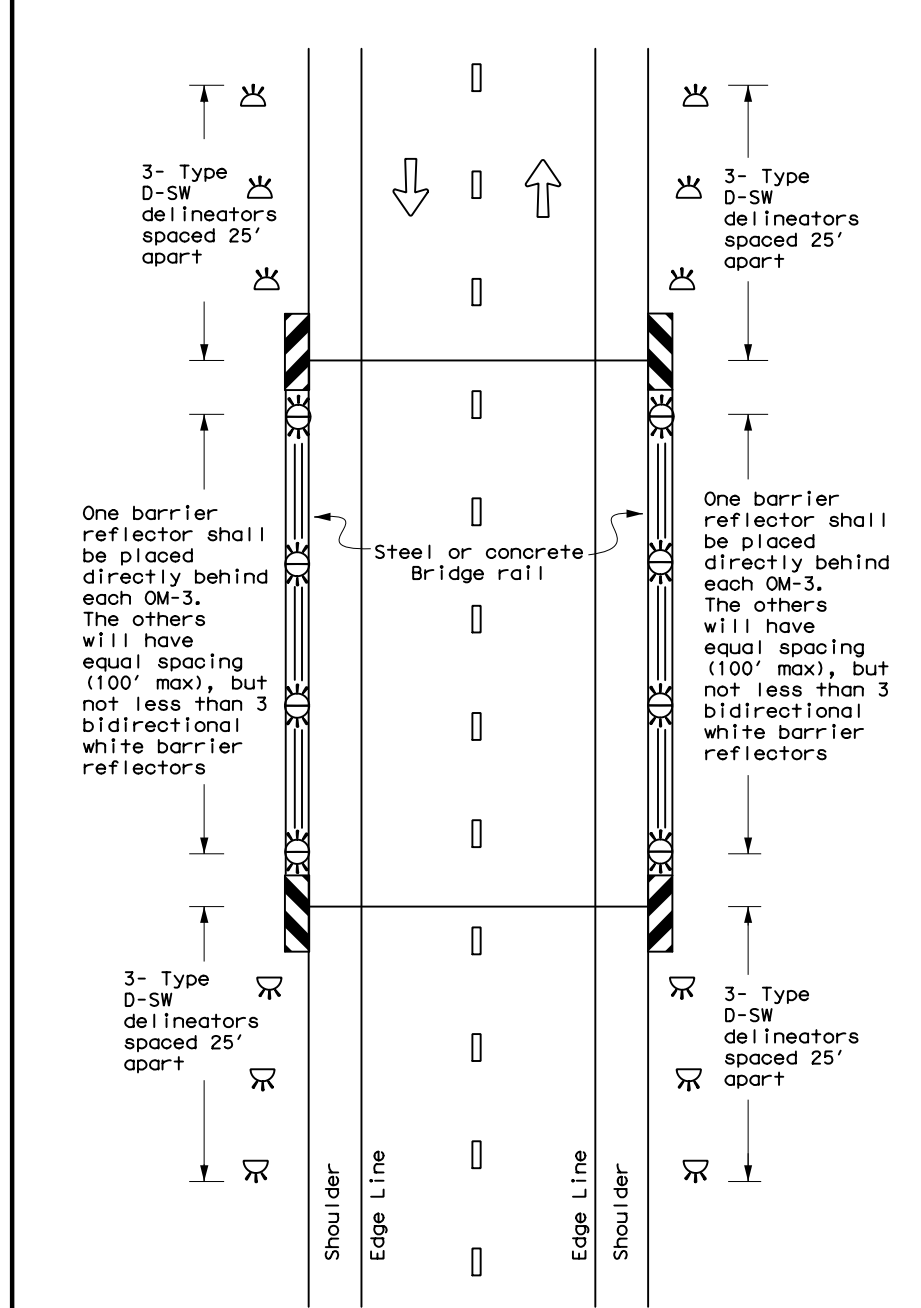
**NOTE:**

1. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.



**NOTE:**

1. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.



LEGEND	
	Bidirectional Delineator
	Delineator
	OM-3
	OM-2
	Terminal End
	Traffic Flow

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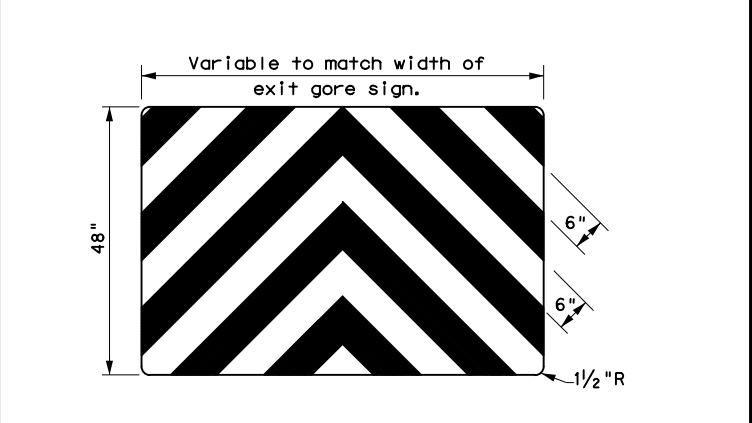
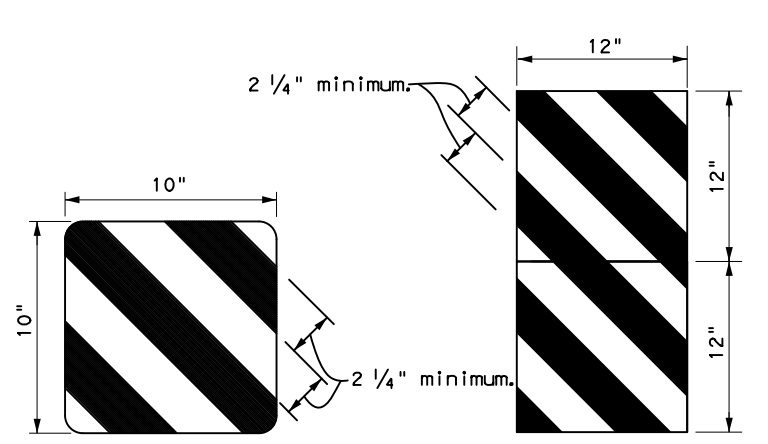
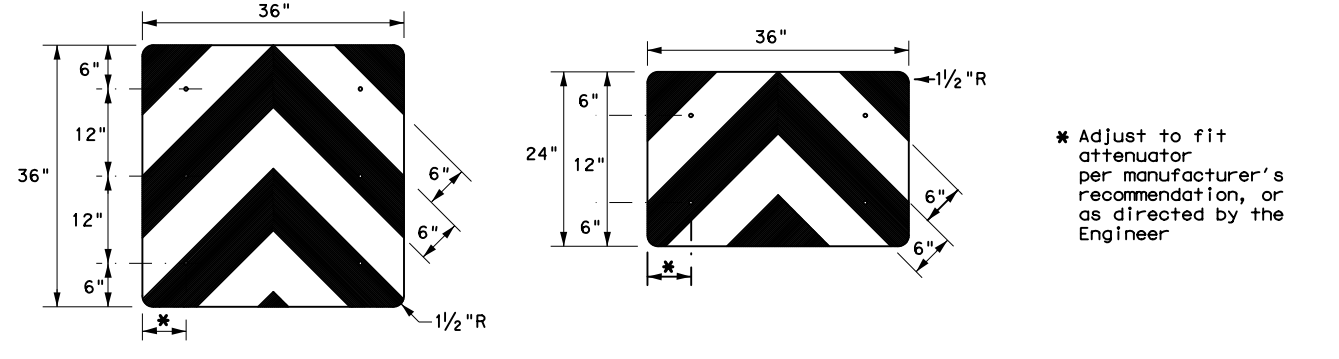
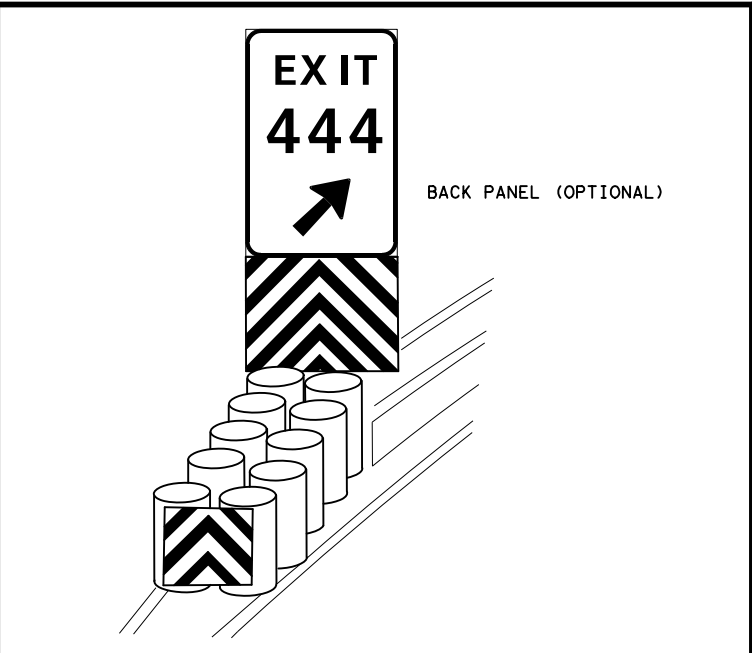
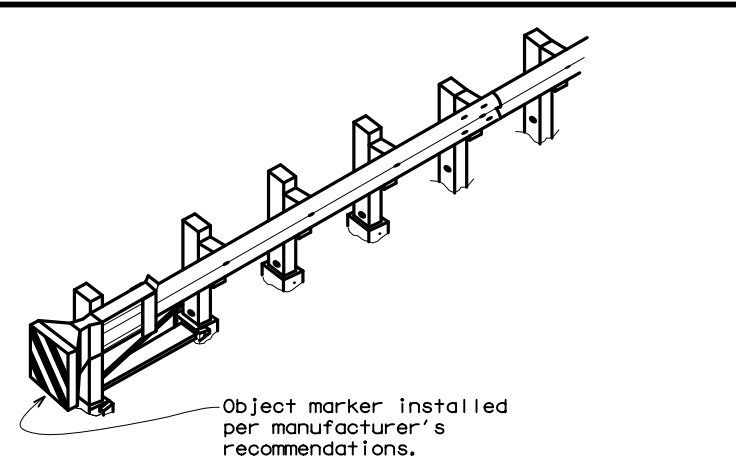
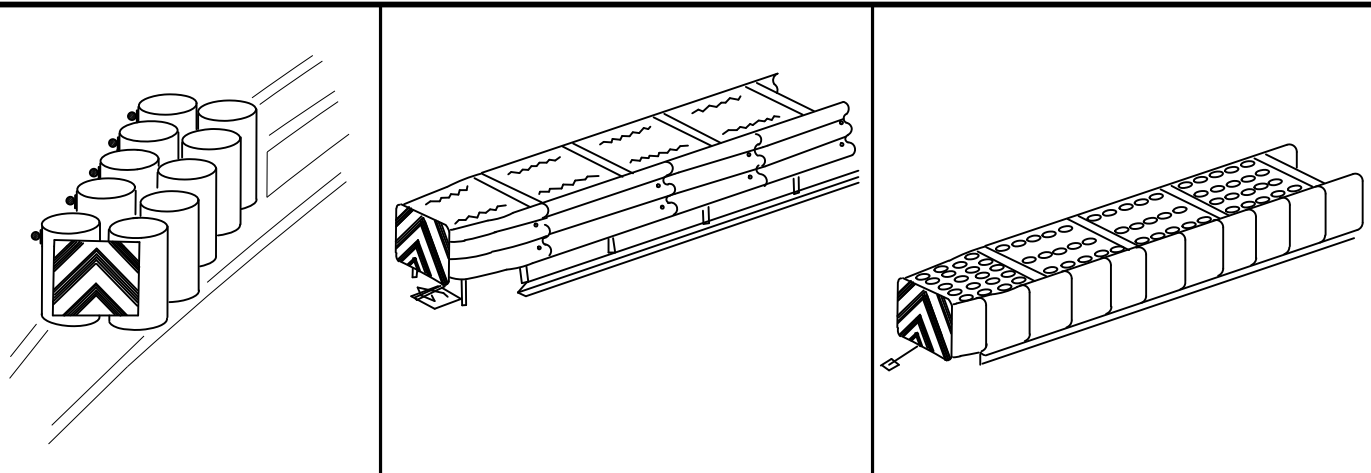
## DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

### D & OM(5)-20

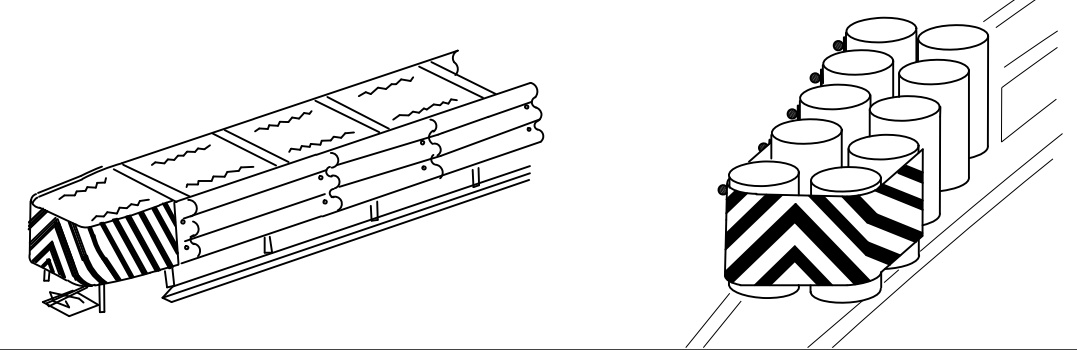
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7-20	REVISIONS	0923	17	084
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	BWD	COMANCHE	26	

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OBJECT MARKERS SMALLER THAN 3 FT<sup>2</sup>

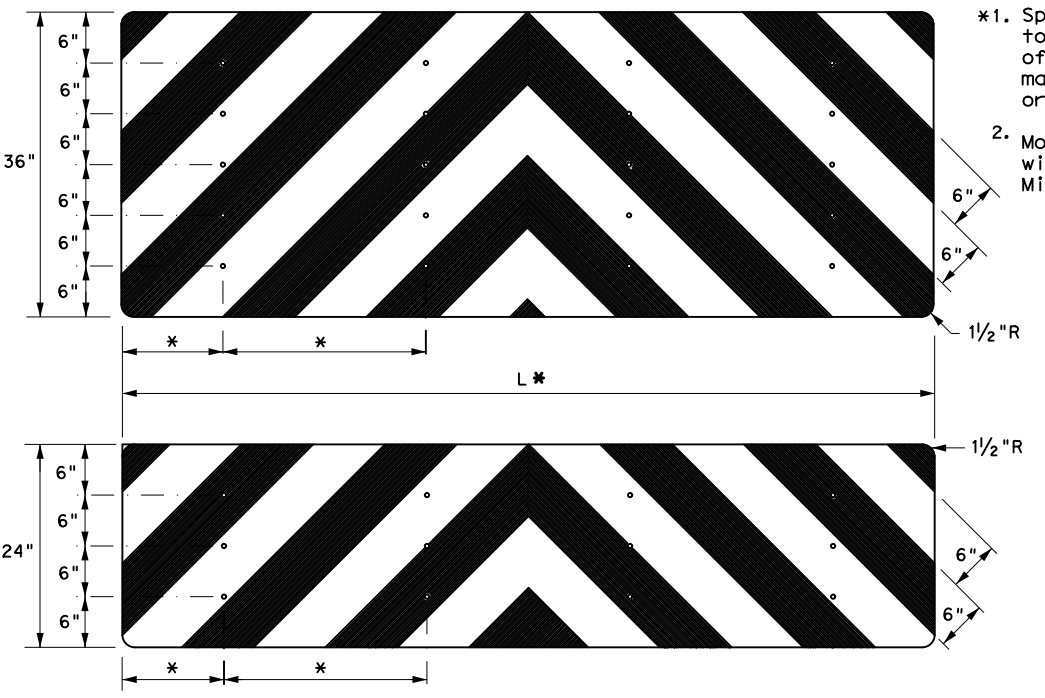


NOTES

- Object Markers shall conform to the Texas MUTCD and meet the color and reflectivity requirement of Department Material Specification DMS 8300. Background shall be yellow reflective sheeting (Type B or C) and Chevron shall be black.
- Object Markers may be fabricated from adhesive backed reflective sheeting applied directly to guardrail end treatment, or applied directly to an "end cap" as per the manufacturer's recommendation. Direct applied sheeting shall provide a smooth surface and have no wrinkles, air bubbles, cuts or tears. A radius at the corners is not required for direct applied sheeting.
- Object Marker size may be reduced to fit smaller devices. Width of alternating black and yellow stripes are typically 6". Object Markers smaller than 3ft may have reduced width stripes of a minimum of 2 1/4".
- Pop rivets, screws, or nuts and bolts may be used to attach object markers and reflectors. Holes, slots or other openings may be cut or drilled through object markers to allow cable or other attachments.
- Object Marker at nose of attenuator is subsidiary to the attenuator.
- See D & OM (1-4) for required barrier reflectors.

NOTES

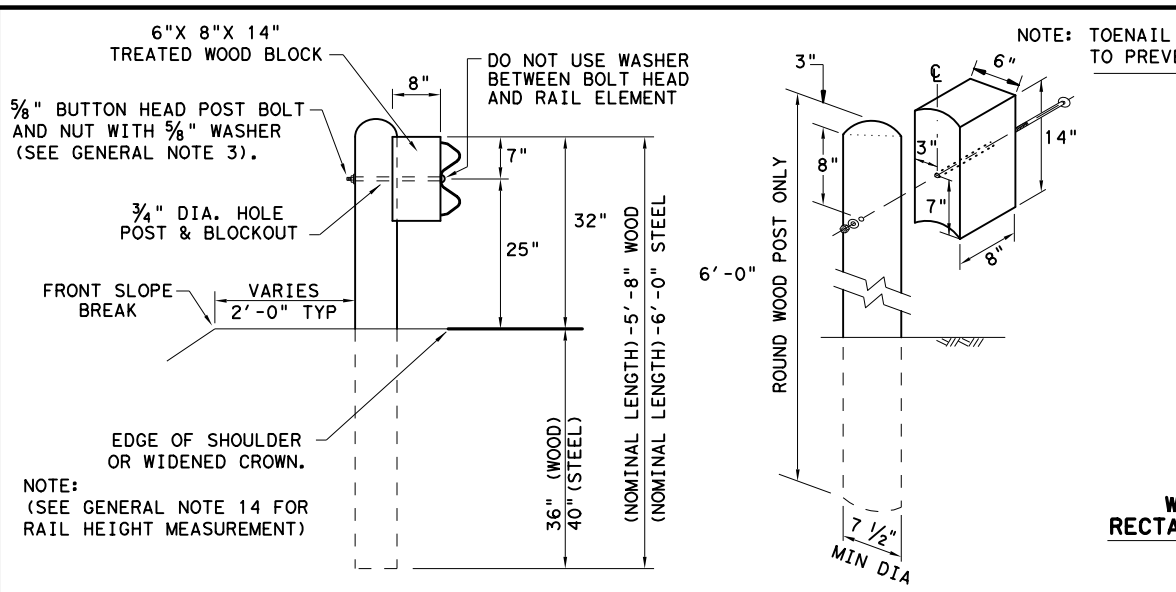
- Spacing should be adjusted to attach through centerline of drum, per attenuator manufacturer's recommendation, or as directed by the Engineer.
- Mounting should be flush with top of attenuator. Minimum size 96" x 24".



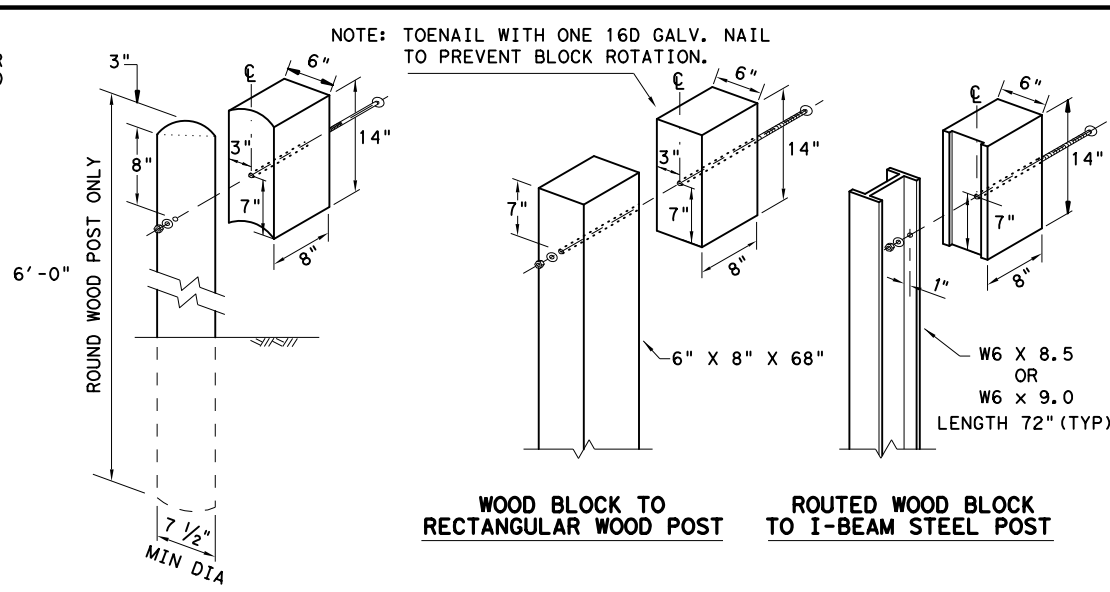
<b>DELINEATOR &amp; OBJECT MARKER FOR VEHICLE IMPACT ATTENUATORS D &amp; OM(VIA)-20</b>			
FILE: domvia20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT
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REVISIONS	0923	17	CR 392
4-92 8-04	DIST	COUNTY	SHEET NO.
8-95 3-15	BWD	COMANCHE	27
4-98 7-20			
206			

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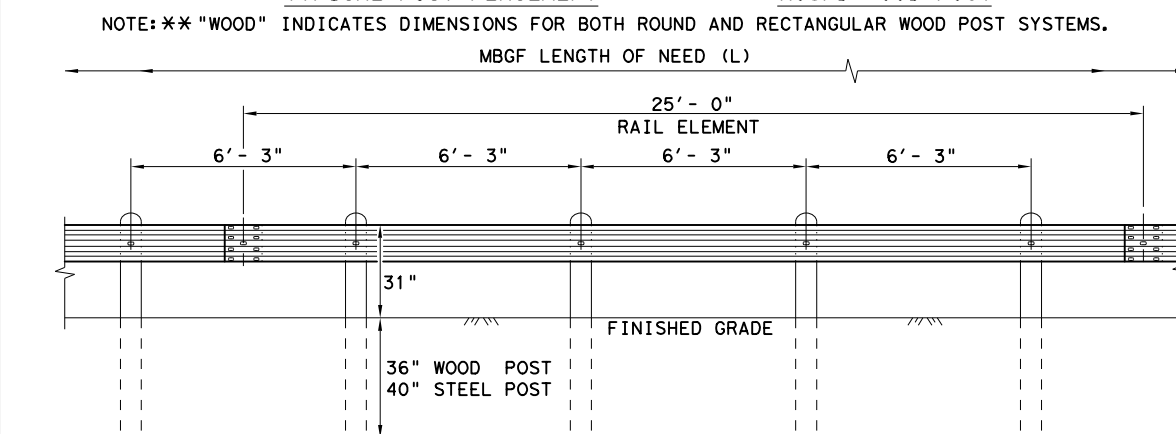


**TYPICAL POST PLACEMENT**



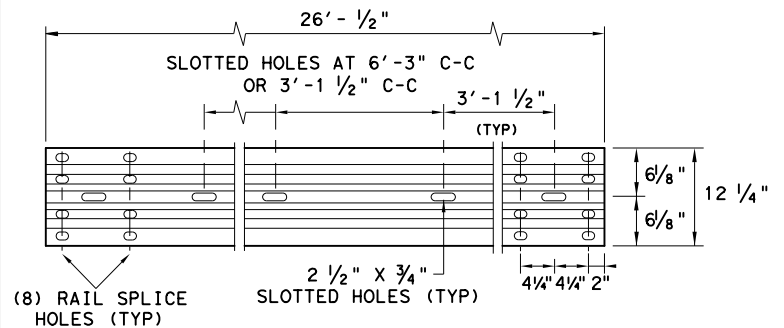
**WOOD BLOCK TO ROUND WOOD POST**      **ROUTED WOOD BLOCK TO I-BEAM STEEL POST**

- GENERAL NOTES**
1. THE TYPE OF POST (ROUND WOOD POST, RECTANGULAR WOOD POST, OR STEEL POST) WILL BE AS SHOWN IN THE PLANS. THE EXACT POSITION OF MBGF SHALL BE SHOWN IN THE PLANS OR AS DIRECTED BY THE ENGINEER. STEEL POSTS TO BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING."
  2. RAIL ELEMENTS SHALL MEET THE REQUIREMENTS OF ITEM 540, "METAL BEAM GUARD FENCE" EXCEPT AS MODIFIED IN THE PLANS. THE CONTRACTOR MAY FURNISH RAIL ELEMENTS OF 25'-0", OR 12'-6" (NOM.) LENGTHS. RAIL ELEMENTS MAY HAVE SLOTTED HOLES AT 3'-1 1/2" C-C OR 6'-3" C-C. A SPECIAL LENGTH OF RAIL MAY BE MANUFACTURED TO ACCOMMODATE THE DOWNSTREAM ANCHOR TERMINAL (DAT) AND THE TRANSITION SECTIONS OF GUARDRAIL.
  3. BUTTON HEAD "POST BOLTS & NUTS" SHALL MEET THE REQUIREMENTS OF (ASTM A307), AND SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT AND 3/8" WASHER (FWC16G) AND NOT MORE THAN 1" BEYOND IT. TRIM REMAINING BOLT LENGTH TO MEET REQUIRED LENGTH.
  4. FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING." FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
  5. CROWN SHALL BE WIDENED TO ACCOMMODATE THE METAL BEAM GUARD FENCE.
  6. THE LATERAL APPROACH TO THE GUARD FENCE, SHALL HAVE A MAXIMUM SLOPE OF 1V:10H.
  7. IF SHOWN ELSEWHERE IN THE PLANS OR AS DIRECTED BY THE ENGINEER, THE GUARD FENCE MAY BE FLARED AT A RATE OF 25:1 OR FLATTER.
  8. UNLESS OTHERWISE SHOWN IN THE PLANS, GUARD FENCE PLACED IN THE VICINITY OF CURBS SHALL BE POSITIONED SO THAT THE FACE OF CURB IS LOCATED DIRECTLY BELOW OR BEHIND THE FACE OF THE RAIL. RAIL PLACED OVER CURBS SHALL BE INSTALLED SO THAT THE POST BOLT IS LOCATED APPROXIMATELY 25 INCHES ABOVE THE GUTTER PAN OR EDGE OF SHOULDER.
  9. APPLICATIONS IN SOLID ROCK ARE ONLY ALLOWED WITH STEEL POSTS. IF SOLID ROCK IS ENCOUNTERED WITHIN 0 TO 18" OF THE FINISHED GRADE, DRILL A 24" DIA. HOLE, 24" INTO THE ROCK. IF SOLID ROCK IS ENCOUNTERED BELOW 18", DRILL A 12" DIA. HOLE, 12" INTO THE ROCK OR TO THE STANDARD EMBEDMENT DEPTH, WHICHEVER MAYBE LESS. ANY EXCESS POST LENGTH, AFTER MEETING THESE DEPTHS, MAY BE FIELD CUT TO ENSURE PROPER GUARDRAIL MOUNTING HEIGHT. BACKFILL WITH COARSE AGGREGATE MATERIAL.
  10. POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.
  11. SPECIAL FABRICATION WILL BE REQUIRED AT INSTALLATION LOCATIONS HAVING A CURVATURE OF LESS THAN 150 FT. RADIUS.
  12. UNLESS OTHERWISE SHOWN IN THE PLANS, A COMPOSITE MATERIAL BLOCK THAT MEETS THE REQUIREMENTS OF DMS-7210, "COMPOSITE MATERIAL POSTS AND BLOCKS FOR METAL BEAM GUARD FENCE" MAY BE SUBSTITUTED FOR BLOCKS OF SIMILAR DIMENSIONS. THE CONSTRUCTION DIVISION, TXDOT MAINTAINS A MATERIAL PRODUCER LIST (MPL) FOR PRODUCERS OF MATERIALS CONFORMING TO DMS-7210 ONLY PRODUCERS ON THE MPL MAY FURNISH COMPOSITE MATERIAL BLOCKS.
  13. FOR THE LOW FILL CULVERT OPTION, POSTS LOCATED PARTIALLY OR WHOLLY BETWEEN PRECAST BOX CULVERT UNITS, THE USE OF A CAST-IN-PLACE CONCRETE CLOSURE BETWEEN BOXES IS REQUIRED. THE LENGTH OF THE CAST-IN-PLACE CONCRETE CLOSURE SHALL ACCOMMODATE THE PLACEMENT OF THE LOW FILL CULVERT OPTION. SEE CONCRETE CLOSURE DETAILS ON BRIDGE STANDARD SCP-MD.
  14. GUARDRAIL HEIGHT MEASUREMENT: WHEN THE GUARDRAIL IS LOCATED ABOVE PAVEMENT, MEASURE THE HEIGHT FROM THE PAVEMENT TO THE TOP OF THE W-BEAM RAIL. WHEN THE GUARDRAIL IS LOCATED UP TO 2 FT. OFF OF THE EDGE OF PAVEMENT OR FOR A PAVEMENT OVERLAY, USE A 10-FOOT STRAIGHTEDGE TO EXTEND THE PAVEMENT/SHOULDER SLOPE TO THE BACK OF RAIL, MEASURE FROM THE BOTTOM OF STRAIGHTEDGE TO THE TOP OF RAIL. FOR GUARDRAIL LOCATED DOWN A 10:1 SLOPE, MEASURE FROM THE NOMINAL TERRAIN.



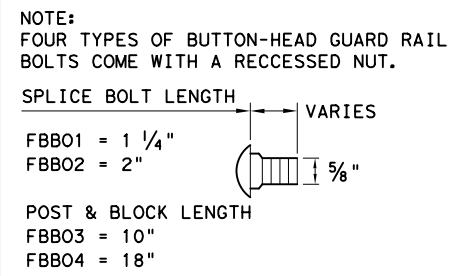
**ELEVATION MID-SPAN RAIL SPLICE**

SHOWING A 25'-0" SECTION OF W-BEAM RAIL. (SEE GENERAL NOTE 2)



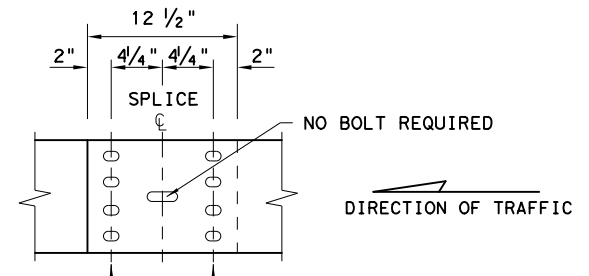
**ELEVATION 25'-0" (NOM.) W-BEAM SECTION**

NOTES: SEE GENERAL NOTE 2 FOR ALLOWABLE RAIL TYPES. SEE RAIL SPLICE DETAIL FOR REQUIRED HARDWARE.



**BUTTON HEAD BOLT**

NOTE: SEE GENERAL NOTE 3 FOR SPLICE & POST BOLT DETAILS.



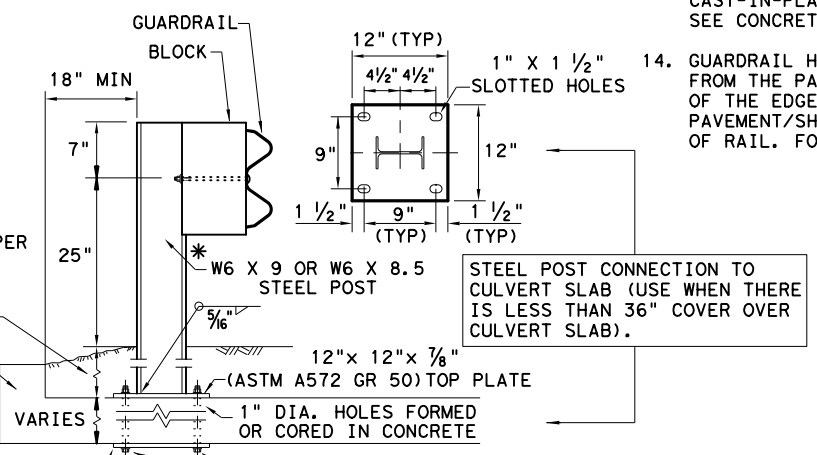
**MID-SPAN RAIL SPLICE DETAIL**

NOTE: GF(31), MID-SPAN RAIL SPLICES ARE REQUIRED WITH 6'-3" POST SPACINGS.

\* POST(S) MAY REQUIRE FIELD MODIFICATION TO ENSURE PROPER GUARDRAIL HEIGHT.

12" X 12" X 1/4" (ASTM A36) STEEL BOTTOM PLATE WITH 1" DIA. HOLES REQUIRED WITH BOLT-THROUGH INSTALLATION.

**LOW FILL CULVERT POST**



NOTE: TWO INSTALLATION OPTIONS.

1. **BOLT-THROUGH OPTION:** REQUIRES A 6" MIN. SLAB THICKNESS. 7/8" DIA (ASTM A449) HEAVY HEX BOLTS WITH TWO HARDENED WASHER EACH AND HEAVY HEX NUTS. NOTE: BOLT LENGTH = SLAB PLUS 2 1/4" MIN.

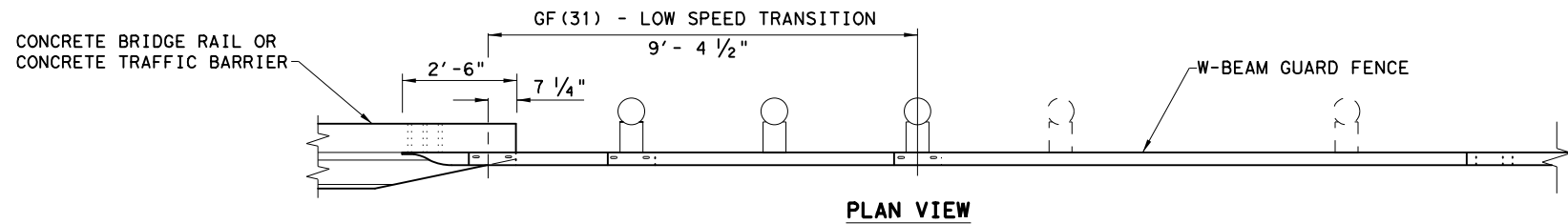
2. **EPOXY ANCHOR OPTION:** THIS OPTION MAY ONLY BE USED IF THE CULVERT SLAB IS 9" MIN. THICK. THREADED ANCHOR RODS MUST BE 7/8" DIA. ASTM A449 OR A193 GRADE B7 WITH HEAVY HEX NUT, AND ONE HARDENED WASHER EACH. EMBED ANCHOR RODS 6" WITH HILTI HIT RE 500 EPOXY ADHESIVE. OTHER TYPE III CLASS C EPOXY ADHESIVES MEETING THE REQUIREMENTS OF DMS-6100, "EPOXIES AND ADHESIVES", MAY BE USED IF IT CAN BE DEMONSTRATED THAT THEY MEET OR EXCEED THE STRENGTH OF HILTI HIT RE 500 WITH THE SAME EMBEDMENT DEPTH AND THREADED ROD DIA. FOLLOW THE MANUFACTURER'S REQUIREMENTS FOR INSTALLING EPOXIED THREADED RODS. EXTEND RODS 1/4" MIN. BEYOND NUT.

NOTE: CULVERTS OF 25 FT. OR LESS, SEE GF(31)LS STANDARD FOR "LONG SPAN" OPTION.

		Design Division Standard	
<b>METAL BEAM GUARD FENCE</b> <b>TL-3 MASH COMPLIANT</b> <b>GF(31)-19</b>			
FILE: gf3119.dgn	DN: TXDOT	CK: KM	DW: VP
© TXDOT: NOVEMBER 2019	CONT	SECT	JOB
REVISIONS	0923	17	084
DIST	COUNTY	SHEET NO.	
BWD	COMANCHE	28	

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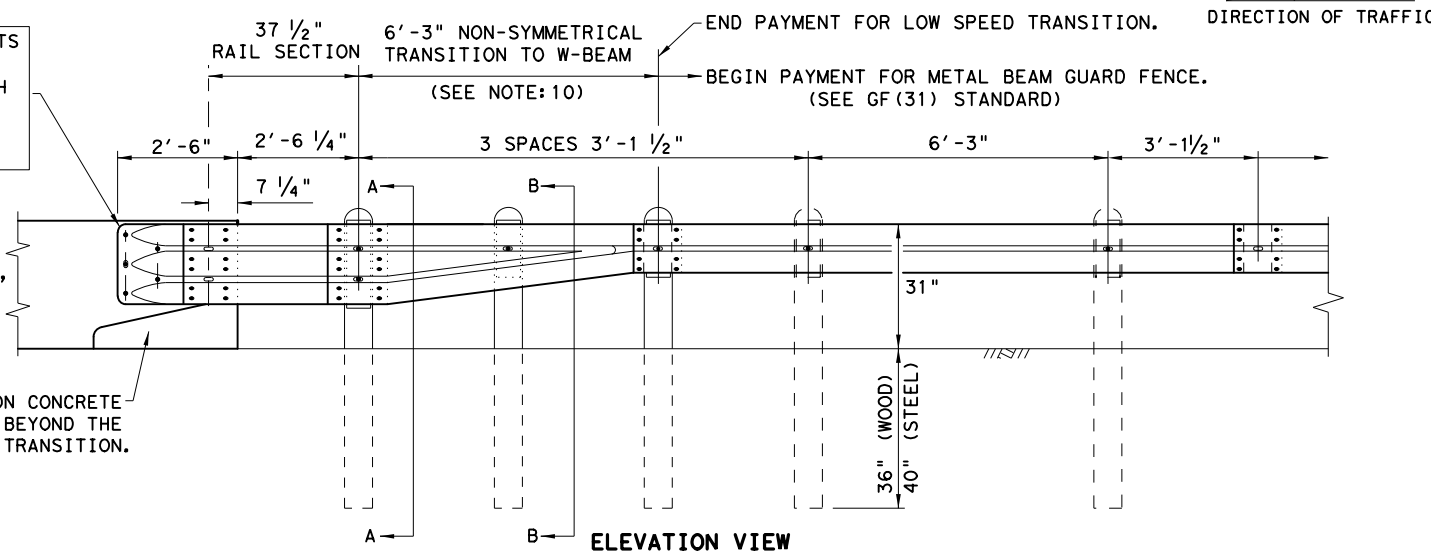
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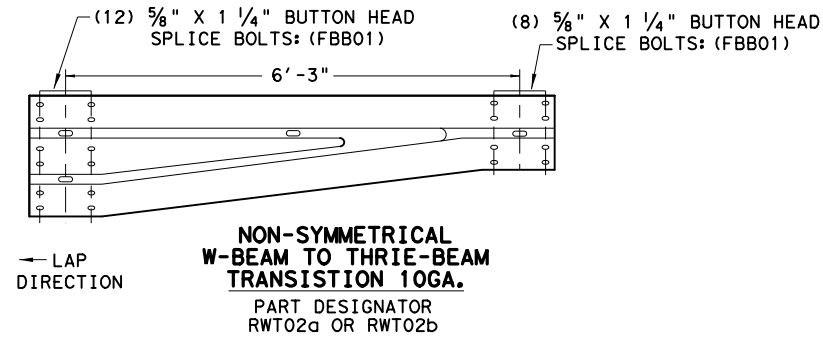
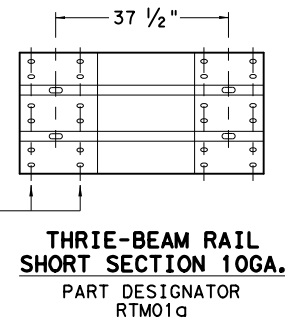
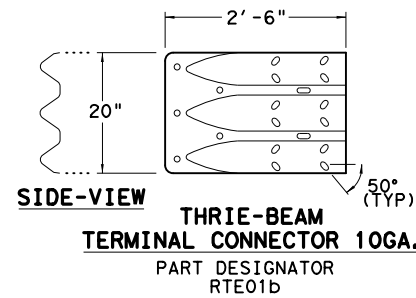
- (5) 7/8" DIA. HEAVY HEX HEAD BOLTS (ASTM A325 OR A449)
- (10) 1 3/4" O.D. WASHER UNDER EACH HEX BOLT HEAD AND NUT.
- (5) 7/8" DIA. HEAVY HEX NUTS (ASTM A194 OR A563)

NOTE: HEAVY HEX BOLT LENGTH WILL VARY DEPENDING ON WIDTH CONCRETE RAIL, LEAVE 1" OF BOLT LENGTH PAST THE 7/8" HEX NUT. TRIM AS REQUIRED.

NOTE: CHAMFER REQUIRED ON CONCRETE RAILS THAT EXTEND BEYOND THE FACE OF GUARDRAIL TRANSITION.



- ### GENERAL NOTES
- THE TYPE OF POST (ROUND WOOD POST, RECTANGULAR WOOD POST, OR STEEL POST) WILL BE AS SHOWN IN THE PLANS. THE EXACT POSITION OF TRANSITIONS SHALL BE AS SHOWN IN THE PLANS OR AS DIRECTED BY THE ENGINEER. REFER TO GF(31) STANDARD SHEET.
  - RAIL ELEMENT SHALL MEET THE REQUIREMENTS OF ITEM 540, "METAL BEAM GUARD FENCE" EXCEPT AS MODIFIED IN THE PLANS.
  - FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING." FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM REQUIRING CONSTRUCTION OF THE TRANSITION.
  - BUTTON HEAD "POST BOLTS & NUTS" SHALL MEET THE REQUIREMENTS OF (ASTM A307), AND SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT AND 5/8" WASHER (FWC16a) AND NOT MORE THAN 1" BEYOND IT. TRIM BOLT LENGTH TO MEET REQUIRED LENGTH.
  - POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.
  - CROWN SHALL BE WIDENED TO ACCOMMODATE TRANSITIONS.
  - WHERE SOLID ROCK IS ENCOUNTERED, CONTACT THE DESIGN DIVISION FOR ADDITIONAL GUIDANCE. (512) 416-2678
  - UNLESS OTHERWISE SHOWN IN THE PLANS, A COMPOSITE MATERIAL BLOCK THAT MEETS THE REQUIREMENTS OF DMS-7210, "COMPOSITE MATERIAL POSTS AND BLOCKS FOR METAL BEAM GUARD FENCE" MAY BE SUBSTITUTED FOR BLOCKS OF SIMILAR DIMENSIONS. THE CONSTRUCTION DIVISION, TXDOT, MAINTAINS A MATERIAL PRODUCER LIST (MPL) FOR PRODUCERS OF MATERIALS CONFORMING TO DMS-7210. ONLY PRODUCERS ON THE MPL CAN FURNISH COMPOSITE MATERIAL BLOCKS.
  - REFER TO GF(31) STANDARD SHEET & BRIDGE RAILING DETAILS FOR ADDITIONAL DETAILS.
  - FOR ROUND WOOD POSTS SYSTEMS, ALL ROUND WOOD POSTS SHALL BE 7 1/2" DIA. MINIMUM THROUGHOUT THE TRANSITION.

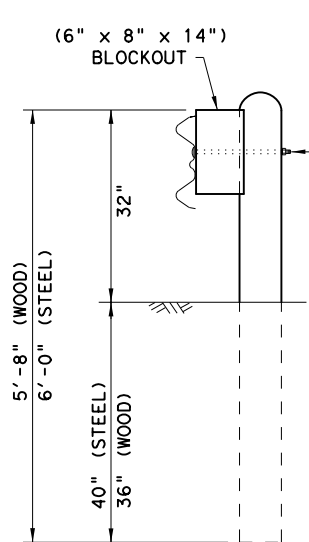
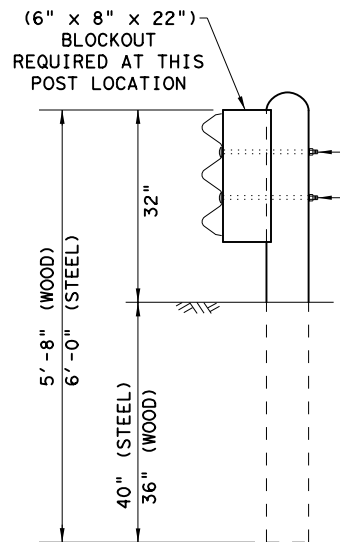


- (2) 5/8" BUTTON HEAD POST BOLTS & NUTS: (FBB04)
- (1) 5/8" FLAT WASHER: (FWC14a) UNDER EACH NUT

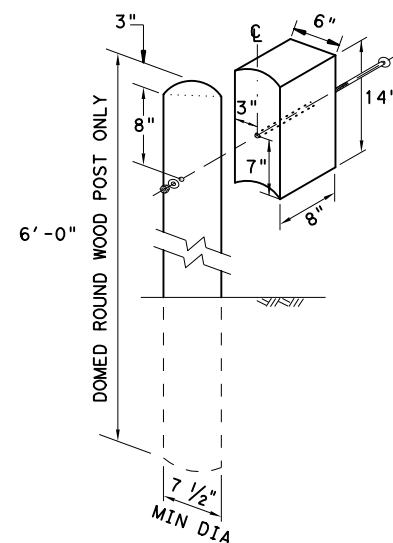
- (1) 5/8" BUTTON HEAD POST BOLT & NUT: (FBB04)
- (1) 5/8" FLAT WASHER: (FWC14a) UNDER EACH NUT

PLATE WASHER INSTRUCTIONS

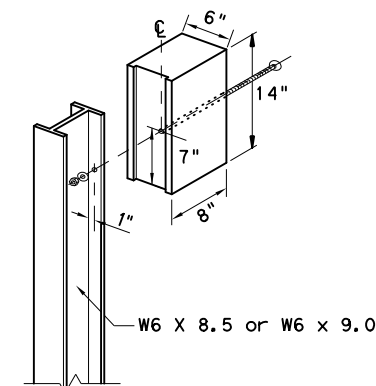
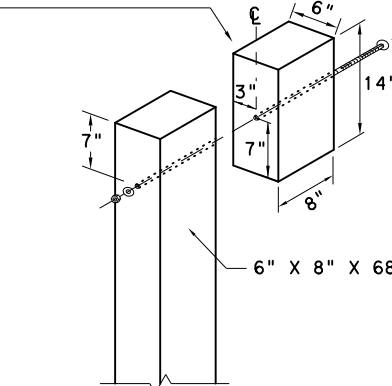
BRIDGE APPROACH - UPSTREAM: THE SHORT RAIL LAPS OVER THE TERMINAL CONNECTOR. PLATE WASHERS ARE INSTALLED UNDER THE SPLICE NUTS AGAINST INSIDE OF CONNECTOR.  
 BRIDGE EXIT - DOWNSTREAM: THE TERMINAL CONNECTOR LAPS OVER THE NESTED RAIL. PLATE WASHERS ARE INSTALLED UNDER THE BOLT HEAD AGAINST OUTSIDE OF CONNECTOR.



NOTE: \* "WOOD" INDICATES DIMENSIONS FOR BOTH ROUND AND RECTANGULAR WOOD POST SYSTEMS.



NOTE: TOENAIL WITH ONE 16D GALV. NAIL TO PREVENT BLOCK ROTATION.

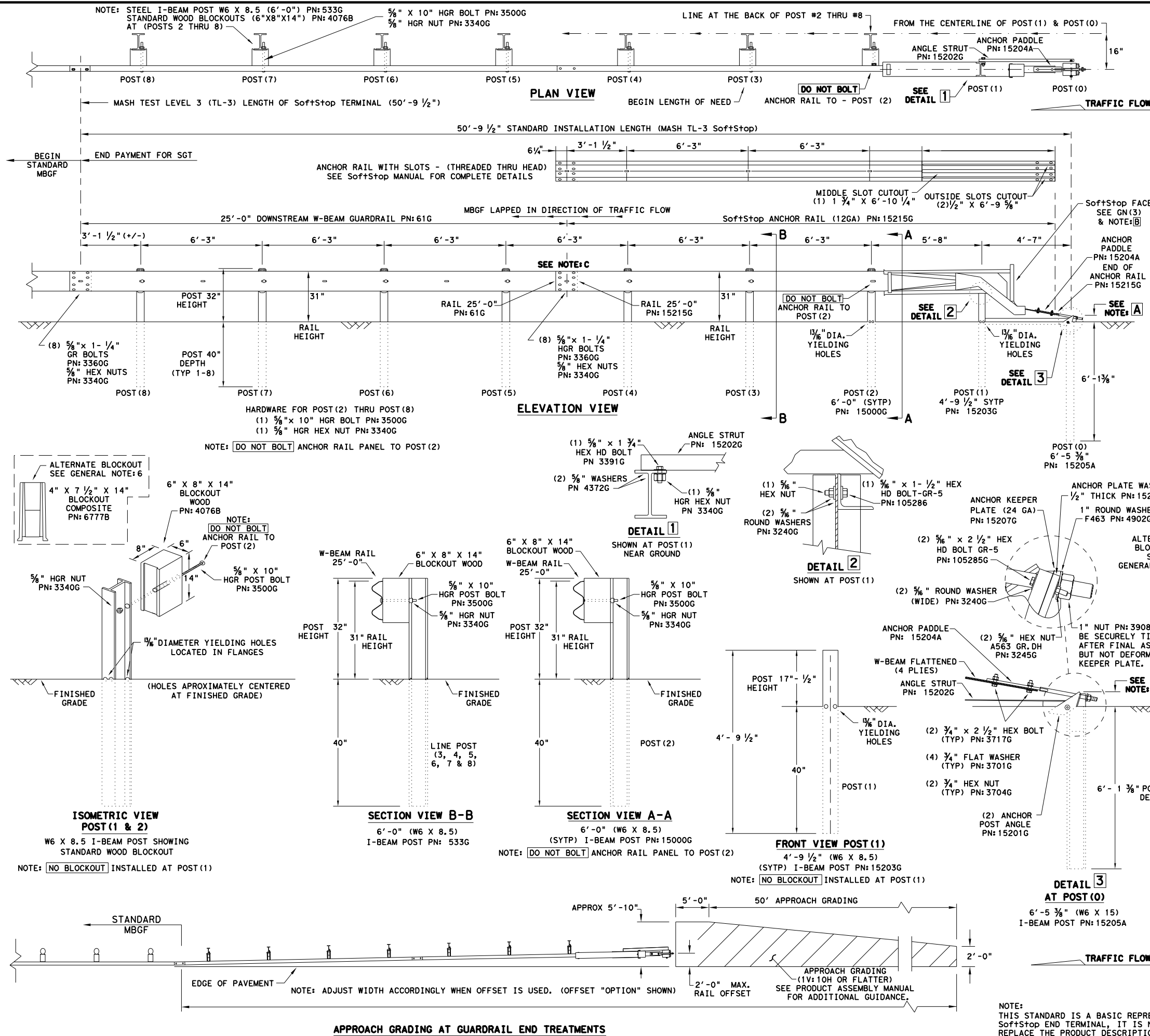


LOW-SPEED TRANSITION

		Design Division Standard	
<b>METAL BEAM GUARD FENCE          THRIE-BEAM TRANSITION          TL-2 MASH COMPLIANT          GF(31) TR TL2-19</b>			
FILE: gf31tr+1219.dgn	DN: TxDOT	CK: KM	DW: VP
© TXDOT: NOVEMBER 2019	CONT	SECT	JOB
REVISIONS	0923	17	084
DIST	COUNTY		SHEET NO.
BWD	COMANCHE		29

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- GENERAL NOTES**
- FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: TRINITY HIGHWAY AT 1(888)323-6374, 2525 N. STEMMONS FREEWAY, DALLAS, TX 75207
  - FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE; SoftStop END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY MANUAL. PN: 620237B
  - APPLY HIGH INTENSITY REFLECTIVE SHEETING, "OBJECT MARKER" ON THE FRONT FACE OF THE DEVICE PER MANUFACTURER'S RECOMMENDATIONS. OBJECT MARKER SHALL CONFORM TO THE STANDARDS REQUIRED IN TEXAS MUTCD.
  - FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TxDOT'S LATEST ROADWAY MOW STRIP STANDARD.
  - HARDWARE (BOLTS, NUTS, & WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
  - A COMPOSITE MATERIAL BLOCKOUT THAT MEETS THE REQUIREMENTS OF DMS-7210, MAY BE SUBSTITUTED FOR BLOCKOUTS OF SIMILAR DIMENSIONS. SEE CONSTRUCTION DIVISION MATERIAL PRODUCER LIST (MPL) FOR CERTIFIED PRODUCERS.
  - IF SOLID ROCK IS ENCOUNTERED SEE THE MANUFACTURER'S INSTALLATION MANUAL AND REFER TO THE LATEST ROADWAY MGBF STANDARD FOR INSTALLATION GUIDANCE.
  - POSTS SHALL NOT BE SET IN CONCRETE.
  - IT IS ACCEPTABLE TO INSTALL THE SoftStop IMPACT HEAD PARALLEL TO THE GRADE LINE OR WITH AN UPWARD TILT.
  - DO NOT ATTACH THE SoftStop SYSTEM DIRECTLY TO A RIGID BARRIER.
  - UNDER NO CIRCUMSTANCES SHALL THE GUARDRAIL WITHIN THE SoftStop SYSTEM BE CURVED.
  - A FLARE RATE OF UP TO 25:1 MAY BE USED TO PREVENT THE TERMINAL HEAD FROM ENCRoaching ON THE SHOULDER. THE FLARE MAY BE DECREASED OR ELIMINATED FOR SPECIFIC INSTALLATIONS, IF DIRECTED BY THE ENGINEER.

**NOTE: A** THE INSTALLATION HEIGHT OF FULLY ASSEMBLED ANCHOR POST WILL VARY FROM 3-3/4" MIN. TO 4" MAX. ABOVE FINISHED GRADE.

**NOTE: B** PART PN: 5852B RIGHT-SIDE (HIGH INTENSITY REFLECTIVE SHEETING)  
PART PN: 5851B LEFT-SIDE (HIGH INTENSITY REFLECTIVE SHEETING)

**NOTE: C** W-BEAM SPLICE LOCATED BETWEEN LINE POST (4) AND LINE POST (5)  
GUARDRAIL PANEL 25'-0" PN: 61G  
ANCHOR RAIL 25'-0" PN: 15215G  
LAP GUARDRAIL IN DIRECTION OF TRAFFIC FLOW.

PART	QTY	MAIN SYSTEM COMPONENTS
620237B	1	PRODUCT DESCRIPTION ASSEMBLY MANUAL (LATEST REV.)
15208A	1	SoftStop HEAD (SEE MANUAL FOR RIGHT-LEFT APPROACH)
15215G	1	SoftStop ANCHOR RAIL (12GA) WITH CUTOUT SLOTS
61G	1	SoftStop DOWNSTREAM W-BEAM RAIL (12GA) (25' - 0")
15205A	1	POST #0 - ANCHOR POST (6' - 5 3/8")
15203G	1	POST #1 - (SYTP) (4' - 9 1/2")
15000G	1	POST #2 - (SYTP) (6' - 0")
533G	6	POST #3 THRU #8 - I-BEAM (W6 X 8.5) (6' - 0")
4076B	7	BLOCKOUT - WOOD (ROUTED) (6" X 8" X 14")
6777B	7	BLOCKOUT - COMPOSITE (4" X 7 1/2" X 14")
15204A	1	ANCHOR PADDLE
15207G	1	ANCHOR KEEPER PLATE (24 GA)
15206G	1	ANCHOR PLATE WASHER (1/2" THICK)
15201G	2	ANCHOR POST ANGLE (10" LONG)
15202G	1	ANGLE STRUT

HARDWARE		
4902G	1	1" ROUND WASHER F436
3908G	1	1" HEAVY HEX NUT A563 GR.DH
3717G	2	3/4" X 2 1/2" HEX BOLT A325
3701G	4	3/4" ROUND WASHER F436
3704G	2	3/4" HEAVY HEX NUT A563 GR.DH
3360G	16	5/8" X 1 1/4" W-BEAM RAIL SPLICE BOLTS HGR
3340G	25	5/8" W-BEAM RAIL SPLICE NUTS HGR
3500G	7	5/8" X 10" HGR POST BOLT A307
3391G	1	5/8" X 1 3/4" HEX HD BOLT A325
4489G	1	5/8" X 9" HEX HD BOLT A325
4372G	4	5/8" WASHER F436
105285G	2	5/8" X 2 1/2" HEX HD BOLT GR-5
105286G	1	5/8" X 1 1/2" HEX HD BOLT GR-5
3240G	6	5/8" ROUND WASHER (WIDE)
3245G	3	5/8" HEX NUT A563 GR.DH
5852B	1	HIGH INTENSITY REFLECTIVE SHEETING - SEE NOTE: B

Texas Department of Transportation  
Design Division Standard

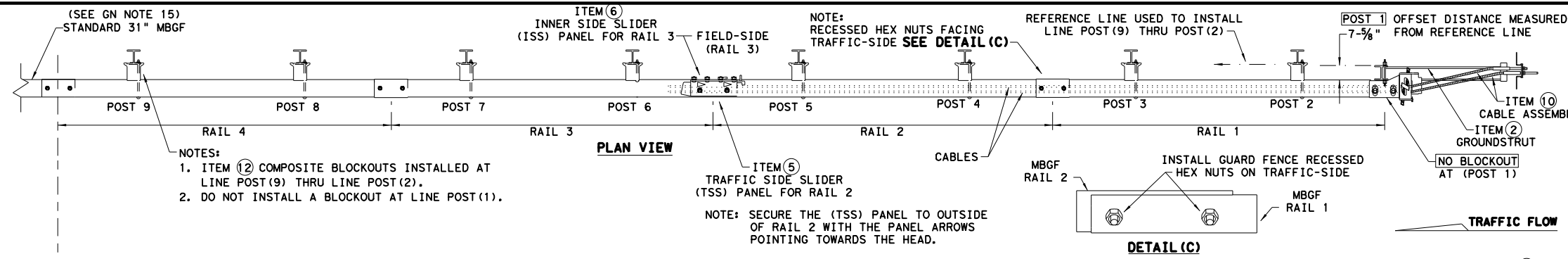
## TRINITY HIGHWAY SOFTSTOP END TERMINAL MASH - TL-3 SGT (10S) 31-16

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© TxDOT: JULY 2016	CONT: 0923	SECT: 17	JOB: 084	HIGHWAY: CR 392
REVISIONS:	DIST: BWD	COUNTY: COMANCHE	SHEET NO. 30	

NOTE: THIS STANDARD IS A BASIC REPRESENTATION OF THE SoftStop END TERMINAL, IT IS NOT INTENDED TO REPLACE THE PRODUCT DESCRIPTION ASSEMBLY MANUAL.

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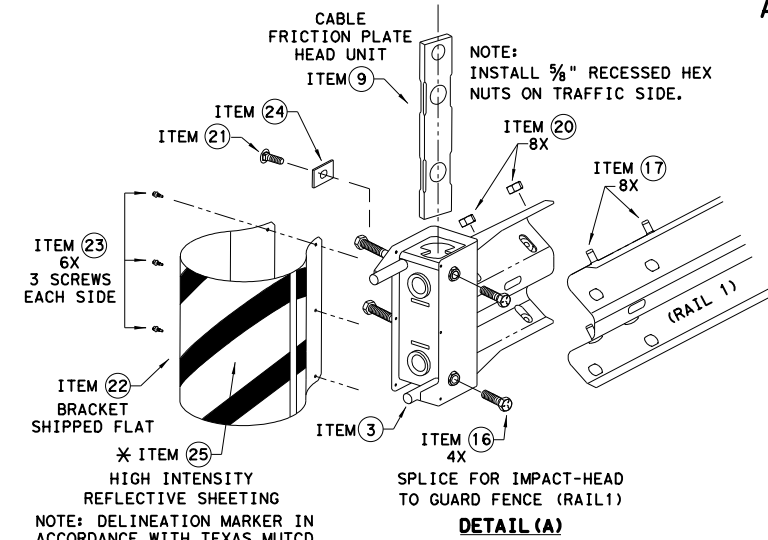
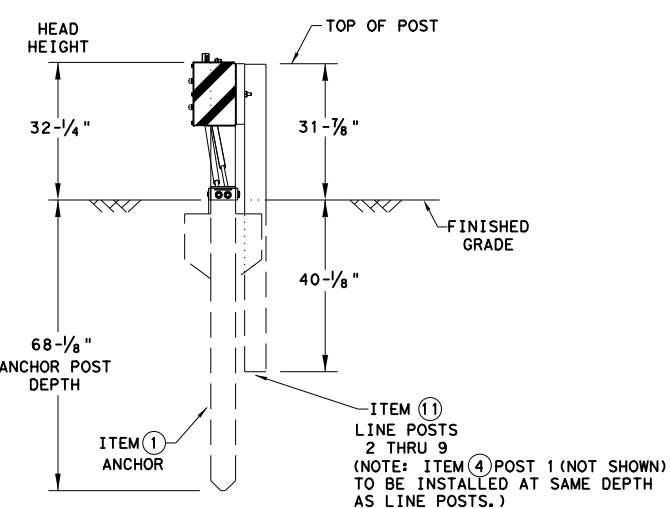
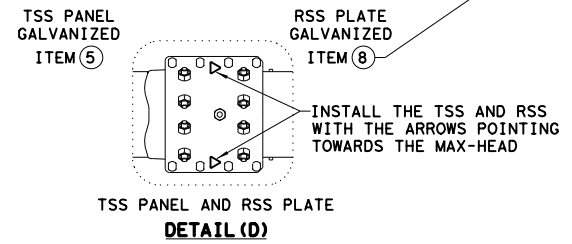
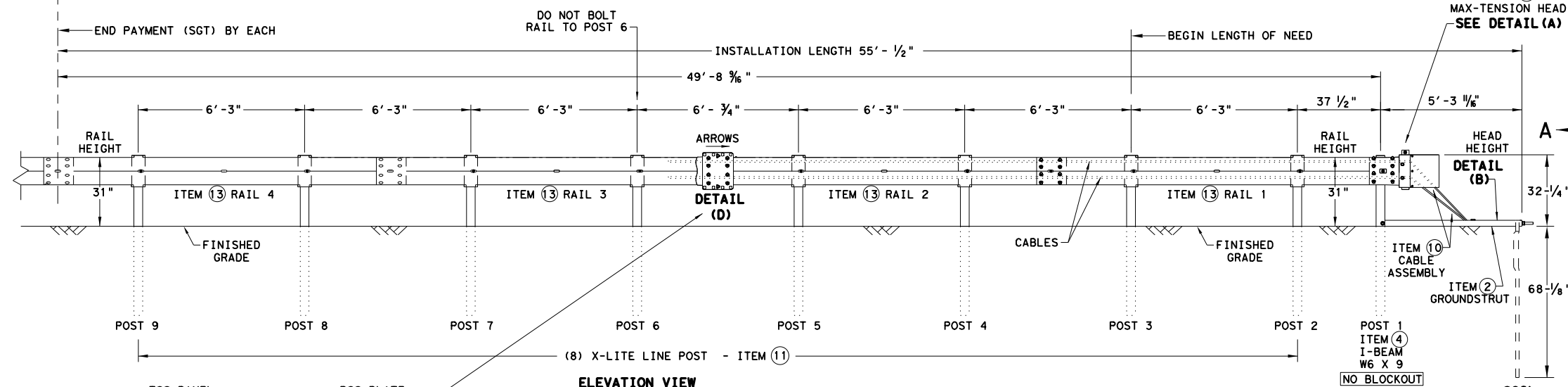
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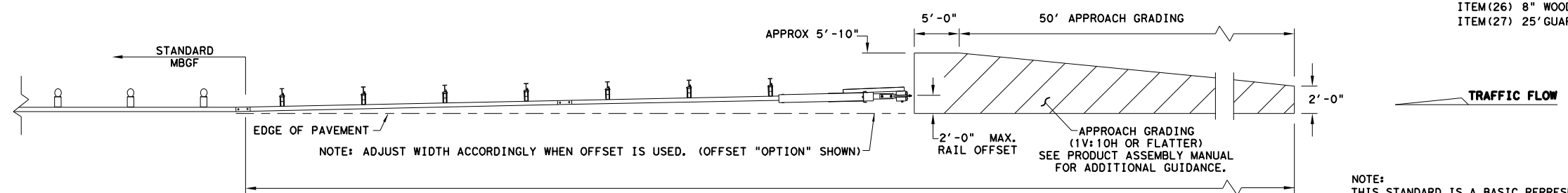
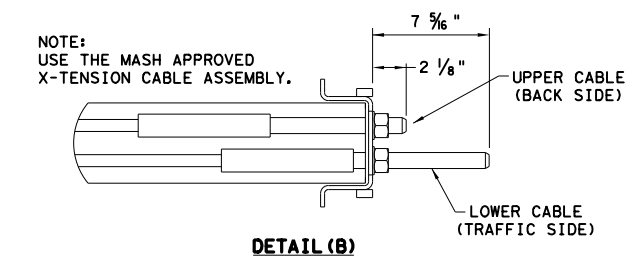
NOTES:  
 1. ITEM ⑫ COMPOSITE BLOCKOUTS INSTALLED AT LINE POST (9) THRU LINE POST (2).  
 2. DO NOT INSTALL A BLOCKOUT AT LINE POST (1).

NOTE: SECURE THE (TSS) PANEL TO OUTSIDE OF RAIL 2 WITH THE PANEL ARROWS POINTING TOWARDS THE HEAD.

- GENERAL NOTES**
- FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: LINDSAY TRANSPORTATION SOLUTIONS (LTS) - BARRIER SYSTEMS, INC. AT (707) 374-6800
  - FOR INSTALLATION, REPAIR, & MAINTENANCE REFER TO THE: MAX-TENSION INSTALLATION INSTRUCTION MANUAL, P/N MANMAX REV D (ECN 3516).
  - APPLY HIGH INTENSITY REFLECTIVE SHEETING, "OBJECT MARKER" ON THE FRONT FACE OF THE DEVICE PER MANUFACTURER'S RECOMMENDATIONS. OBJECT MARKER SHALL CONFORM TO THE STANDARDS REQUIRED IN TEXAS MUTCD.
  - FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TxDOT'S LATEST ROADWAY MOW STRIP STANDARD.
  - ALL STEEL COMPONENTS ARE GALVANIZED PER ASTM A123 OR EQUIVALENT UNLESS OTHERWISE STATED.
  - SYSTEM SHOWN USING STEEL WIDE FLANGE POST WITH COMPOSITE BLOCKOUTS.
  - COMPOSITE MATERIAL BLOCKOUT THAT MEETS THE REQUIREMENTS OF DMS-7210, MAY BE SUBSTITUTED FOR BLOCKOUTS SIMILAR DIMENSIONS. SEE CONSTRUCTION DIVISION MATERIAL PRODUCER LIST (MPL) FOR CERTIFIED PRODUCERS.
  - REFER TO INSTALLATION MANUAL FOR SPECIFIC PANEL LAPPING GUIDANCE.
  - IF SOLID ROCK IS ENCOUNTERED SEE THE MANUFACTURER'S INSTALLATION MANUAL FOR INSTALLATION GUIDANCE.
  - POSTS SHALL NOT BE SET IN CONCRETE.
  - A DRIVING CAP WITH A TIMBER OR PLASTIC INSERT SHALL BE USED WHEN DRIVING POST TO PREVENT DAMAGE TO THE GALVANIZING ON TOP OF THE POST.
  - MAX-TENSION SYSTEM SHALL NEVER BE INSTALLED WITHIN A CURVED SECTION OF GUARDRAIL.
  - IF A DELINEATION MARKER IS REQUIRED, MARKER SHALL BE IN ACCORDANCE WITH TEXAS MUTCD.
  - THE SYSTEM IS SHOWN WITH 12'-6" MBGF PANELS, 25'-0" MBGF PANELS ARE ALSO ALLOWED.
  - A MINIMUM OF 12'-6" OF 12GA. MBGF IS REQUIRED IMMEDIATELY DOWNSTREAM OF THE MAX-TENSION SYSTEM.



ITEM #	PART NUMBER	DESCRIPTION	QTY
1	BSI-1610060-00	SOIL ANCHOR - GALVANIZED	1
2	BSI-1610061-00	GROUND STRUT - GALVANIZED	1
3	BSI-1610062-00	MAX-TENSION IMPACT HEAD	1
4	BSI-1610063-00	W6x9 I-BEAM POST 6FT.-GALVANIZED	1
5	BSI-1610064-00	TSS PANEL - TRAFFIC SIDE SLIDER	1
6	BSI-1610065-00	ISS PANEL - INNER SIDE SLIDER	1
7	BSI-1610066-00	TOOTH - GEOMET	1
8	BSI-1610067-00	RSS PLATE - REAR SIDE SLIDER	1
9	B061058	CABLE FRICTION PLATE - HEAD UNIT	1
10	BSI-1610069-00	CABLE ASSEMBLY - MASH X-TENSION	2
11	BSI-1012078-00	X-LITE LINE POST-GALVANIZED	8
12	B090534	8" W-BEAM COMPOSITE-BLOCKOUT XT110	8
13	BSI-4004386	12'-6" W-BEAM GUARD FENCE PANELS 12GA.	4
14	BSI-1102027-00	X-LITE SQUARE WASHER	1
15	BSI-2001886	5/8" X 7" THREAD BOLT HH (GR.5)GEOMET	1
16	BSI-2001885	3/4" X 3" ALL-THREAD BOLT HH (GR.5)GEOMET	4
17	4001115	5/8" X 1 1/4" GUARD FENCE BOLTS (GR.2)MGAL	48
18	2001840	5/8" X 10" GUARD FENCE BOLTS MGAL	8
19	2001636	5/8" WASHER F436 STRUCTURAL MGAL	2
20	4001116	5/8" RECESSED GUARD FENCE NUT (GR.2)MGAL	59
21	BSI-2001888	5/8" X 2" ALL THREAD BOLT (GR.5)GEOMET	1
22	BSI-1701063-00	DELINEATION MOUNTING (BRACKET)	1
23	BSI-2001887	1/4" X 3/4" SCREW SD HH 410SS	7
24	4002051	GUARDRAIL WASHER RECT AASHTO FWRO3	1
25	SEE NOTE BELOW	HIGH INTENSITY REFLECTIVE SHEETING	1
26	4002337	8" W-BEAM TIMBER-BLOCKOUT, PDB01B	8
27	BSI-4004431	25' W-BEAM GUARDRAIL PANEL, 8-SPACE, 12GA.	2
28	MANMAX Rev-(D)	MAX-TENSION INSTALLATION INSTRUCTIONS	1



NOTE: TxDOT GENERIC APPROACH GRADING LAYOUT USED FOR ALL TANGENT TYPE END TREATMENTS.

APPROACH GRADING AT GUARDRAIL END TREATMENTS

NOTE: THIS STANDARD IS A BASIC REPRESENTATION OF THE MAX-TENSION END TERMINAL, IT IS NOT INTENDED TO REPLACE THE PRODUCT DESCRIPTION ASSEMBLY MANUAL.

\* TO BE PROVIDED BY DISTRIBUTOR OR CONTRACTOR.  
 \*\* ALTERNATIVE ITEMS NOT SHOWN. ITEM (26) 8" WOOD-BLOCKOUTS ITEM (27) 25' GUARD FENCE PANELS

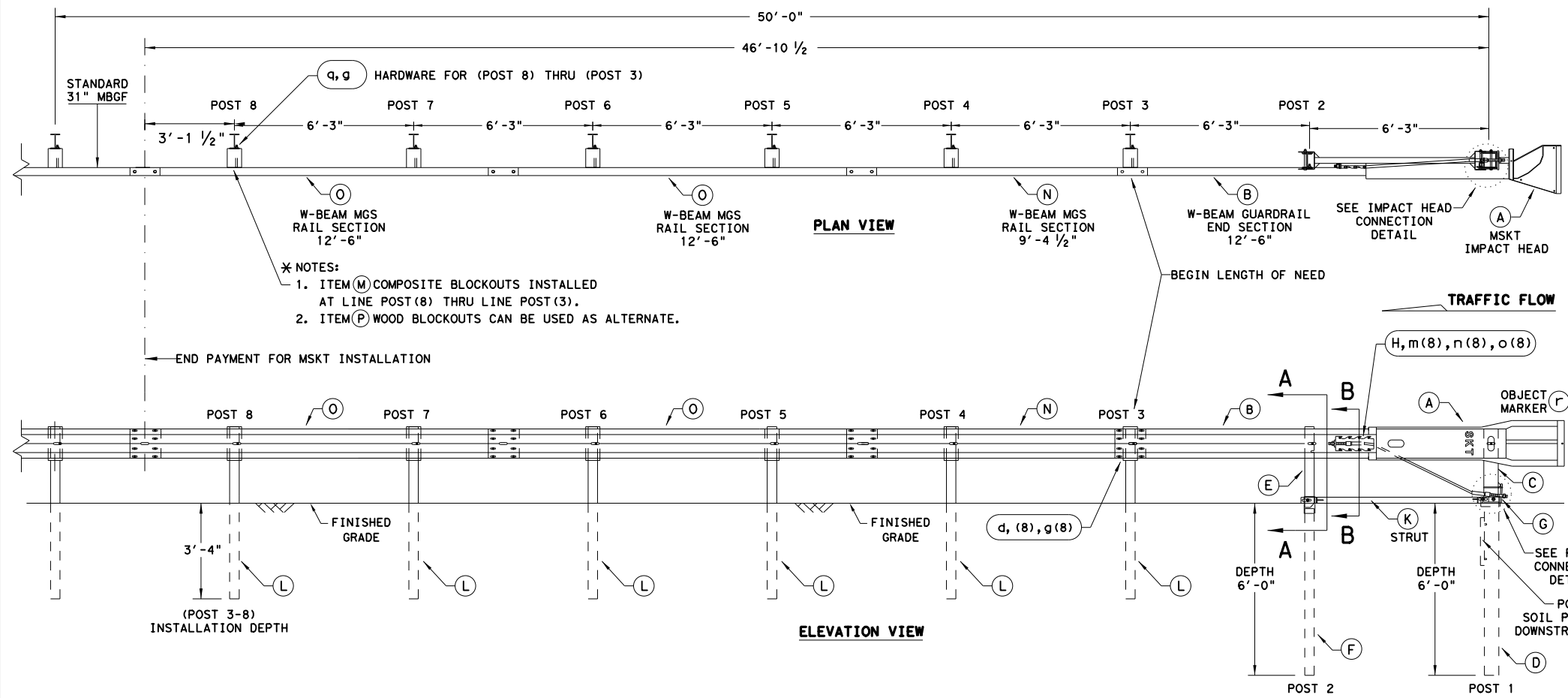
**Texas Department of Transportation**  
 Design Division Standard

**MAX-TENSION END TERMINAL**  
**MASH - TL-3**  
**SGT (11S) 31-18**

FILE: sgt11s3118.dgn	DN: TxDOT	CK: KM	DW: TxDOT	CK: CL
© TxDOT: FEBRUARY 2018	CONT	SECT	JOB	HIGHWAY
REVISIONS	0923	17	084	CR 392
DIST	COUNTY		SHEET NO.	
BWD	COMANCHE		31	

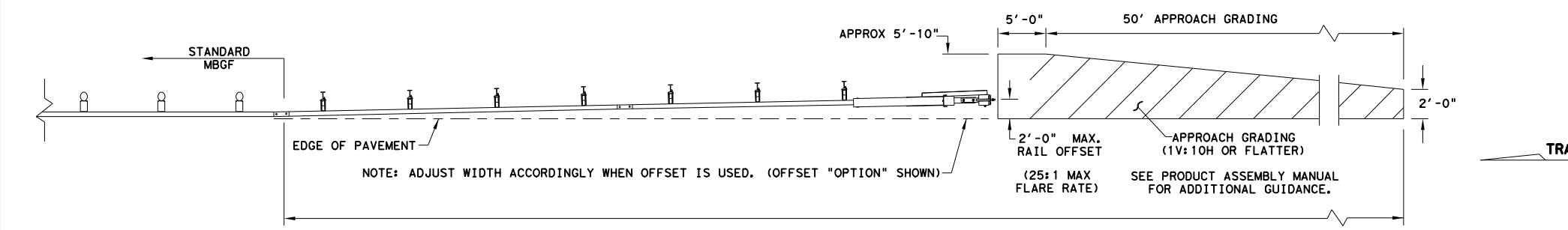
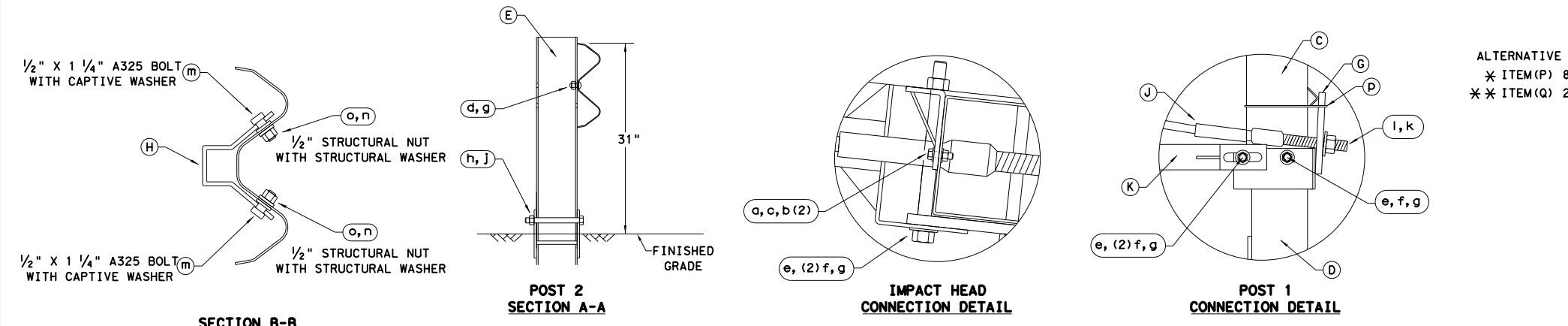
DISCLAIMER: THIS STANDARD IS GOVERNED BY THE "TEXAS ENGINEERING PRACTICE ACT". NO WARRANTY OF ANY KIND IS MADE BY TXDOT FOR ANY PURPOSE WHATSOEVER. TXDOT ASSUMES NO RESPONSIBILITY FOR THE CONVERSION OF THIS STANDARD TO OTHER FORMATS OR FOR INCORRECT RESULTS OR DAMAGES RESULTING FROM ITS USE.

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- GENERAL NOTES**
- FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: ROAD SYSTEMS, INC. (432)263-2435. 3616 OLD HOWARD COUNTY AIRPORT, BIG SPRING, TX 79720
  - FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE; MSKT END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY MANUAL (PUBLICATION-062717).
  - APPLY HIGH INTENSITY REFLECTIVE SHEETING, "OBJECT MARKER" ON THE FRONT FACE OF THE DEVICE PER MANUFACTURER'S RECOMMENDATIONS. OBJECT MARKER SHALL CONFORM TO THE STANDARDS REQUIRED IN TEXAS MUTCD.
  - FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TXDOT'S LATEST ROADWAY MOW STRIP STANDARD.
  - HARDWARE (BOLTS, NUTS, & WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
  - SYSTEM SHOWN USING STEEL WIDE FLANGE POSTS WITH COMPOSITE BLOCKOUTS.
  - A COMPOSITE MATERIAL BLOCKOUTS THAT MEETS THE REQUIREMENTS OF DMS-7210, MAY BE SUBSTITUTED FOR BLOCKOUTS OF SIMILAR DIMENSIONS. SEE CONSTRUCTION DIVISION MATERIAL PRODUCER LIST (MPL) FOR CERTIFIED PRODUCERS.
  - IF SOLID ROCK IS ENCOUNTERED IN THE AREA OF (POST 1) AND / OR (POST 2) CONTACT THE MANUFACTURER, & REFER TO THE LATEST ROADWAY MBSGF STANDARD FOR INSTALLATION GUIDANCE.
  - POSTS SHALL NOT BE SET IN CONCRETE.
  - SYSTEM MUST BE ATTACHED TO STANDARD 31" MBSGF.
  - UNDER NO CIRCUMSTANCES SHALL THE GUARDRAIL WITHIN THE MSKT SYSTEM BE CURVED.
  - A FLARE RATE OF UP TO 25:1 MAY BE USED TO PREVENT THE TERMINAL HEAD FROM ENCRANCHING ON THE SHOULDER. THE FLARE MAY BE DECREASED OR ELIMINATED FOR SPECIFIC INSTALLATIONS, IF DIRECTED BY THE ENGINEER.
  - THE SYSTEM IS SHOWN WITH TWO 12'-6" MBSGF PANELS, ONE 25'-0" MBSGF PANEL IS ALSO ALLOWED IN ITS PLACE.
  - A DRIVING CAP WITH A TIMBER OR PLASTIC INSERT SHALL BE USED WHEN DRIVING POSTS 3-8 TO PREVENT DAMAGE TO THE GALVANIZING ON TOP OF THE POST. SPECIAL DRIVING CAP TO BE USED ON LOWER POSTS 1 & 2 TO PREVENT DAMAGE TO THE WELDED PLATES.

ITEM	QTY	MAIN SYSTEM COMPONENTS	ITEM NUMBERS
A	1	MSKT IMPACT HEAD	MS3000
B	1	W-BEAM GUARDRAIL END SECTION, 12 Ga.	SF1303
C	1	POST 1 - TOP (6" X 6" X 1/8" TUBE)	MTPHP1A
D	1	POST 1 - BOTTOM (6' W6X15)	MTPHP1B
E	1	POST 2 - ASSEMBLY TOP	UHP2A
F	1	POST 2 - ASSEMBLY BOTTOM (6' W6X9)	HP2B
G	1	BEARING PLATE	E750
H	1	CABLE ANCHOR BOX	S760
J	1	BCT CABLE ANCHOR ASSEMBLY	E770
K	1	GROUND STRUT	MS785
L	6	W6X9 OR W6X8.5 STEEL POST	P621
M	6	COMPOSITE BLOCKOUTS	CBSP-14
N	1	W-BEAM MGS RAIL SECTION (9'-4 1/2")	G12025
O	2	W-BEAM MGS RAIL SECTION (12'-6")	G1203A
P	6	WOOD BLOCKOUT 6" X 8" X 14"	P675
Q	1	W-BEAM MGS RAIL SECTION (25'-0")	G1209
SMALL HARDWARE			
a	2	5/8" x 1" HEX BOLT (GRD 5)	B5160104A
b	4	5/8" WASHER	W0516
c	2	5/8" HEX NUT	N0516
d	25	5/8" Dia. x 1 1/4" SPLICE BOLT (POST 2)	B580122
e	2	5/8" Dia. x 9" HEX BOLT (GRD A449)	B580904A
f	3	5/8" WASHER	W050
g	33	5/8" Dia. H.G.R NUT	N050
h	1	3/4" Dia. x 8 1/2" HEX BOLT (GRD A449)	B340854A
j	1	3/4" Dia. HEX NUT	N030
k	2	1 ANCHOR CABLE HEX NUT	N100
l	2	1 ANCHOR CABLE WASHER	W100
m	8	1/2" x 1 1/4" A325 BOLT WITH CAPTIVE WASHER	SB12A
n	8	1/2" STRUCTURAL NUTS	N012A
o	8	1 1/8" O.D. x 3/8" I.D. STRUCTURAL WASHERS	W012A
p	1	BEARING PLATE RETAINER TIE	CT-100ST
q	6	5/8" x 10" H.G.R. BOLT	B581002
r	1	OBJECT MARKER 18" X 18"	E3151



NOTE: TXDOT GENERIC APPROACH GRADING LAYOUT USED FOR ALL TANGENT TYPE END TREATMENTS.

NOTE: THIS STANDARD IS A BASIC REPRESENTATION OF THE MSKT END TERMINAL, IT IS NOT INTENDED TO REPLACE THE PRODUCT DESCRIPTION ASSEMBLY MANUAL.

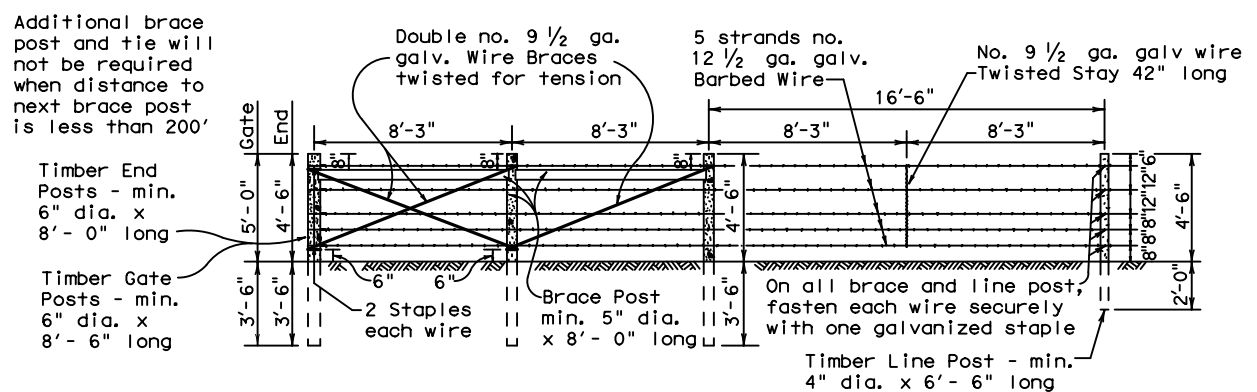
**SINGLE GUARDRAIL TERMINAL**  
**MSKT-MASH-TL-3**  
**SGT (12S) 31-18**

FILE: sgt12s3118.dgn	DN: TXDOT	CK: KM	DW: VP	CK: CL
© TXDOT: APRIL 2018	CONT	SECT	JOB	HIGHWAY
REVISIONS	0923	17	084	CR 392
DIST	COUNTY		SHEET NO.	
BWD	COMANCHE		32	



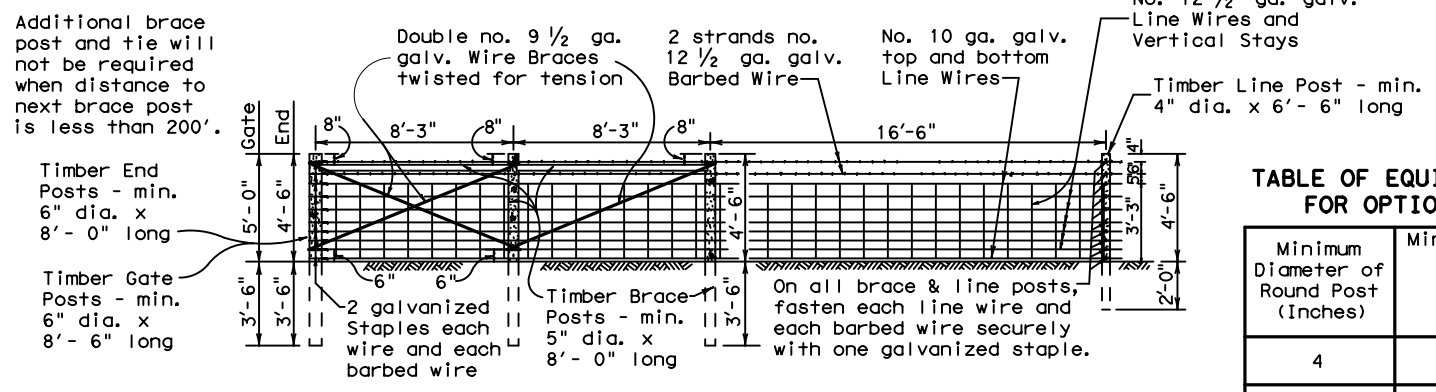
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE: 12/19/2023  
 FILE: R:\1005000-1005999\1005472\_03\04\_DOCUMENTS\DESIGN\Plan\_Set\3\_Roadway\Standards\wf110.dgn



**SECTION GALVANIZED BARBED WIRE FENCE WITH WOOD POSTS**  
 Bracing Detail Used at Ends and Gates

**TYPE "A" FENCE**  
 (See General Note 6)



**SECTION GALVANIZED WOVEN WIRE FENCE WITH WOOD POSTS**  
 Bracing Detail Used at Ends and Gates

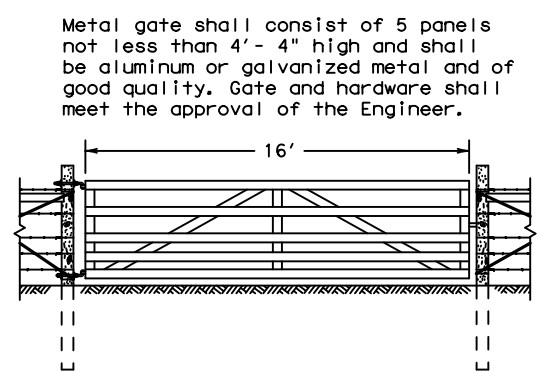
**TYPE "B" FENCE**  
 (See General Note 6)

**TABLE OF EQUIVALENT SIZES FOR OPTIONAL SHAPE**

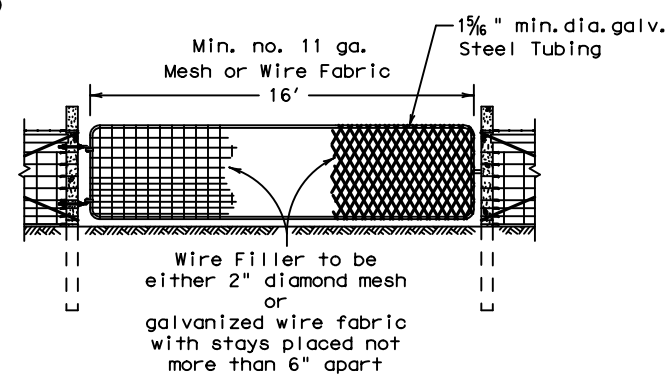
Minimum Diameter of Round Post (Inches)	Minimum Equivalent Dimension for Each Side of Square Post (Inches)
4	3 1/2
5	4 1/2
6	5 1/4

**GENERAL NOTES**

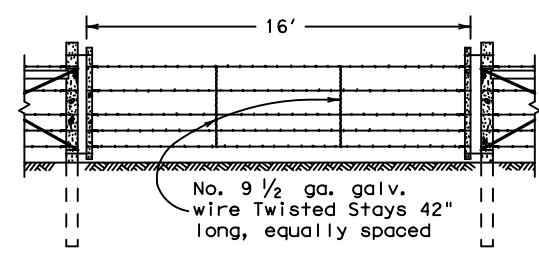
- Any high point which interferes with the placing of wire mesh shall be excavated to provide 2" clearance.
  - Latches for Type 1 and Type 2 gates shall be good commercial quality and design latches of the spring, fork or chain type. All latches shall be suitable for the gate and shall be approved by the Engineer.
  - Hinges for Type 2 gates shall be commercial design approved by the Engineer suitable for post and gate.
  - Concrete shall be of the design and consistency approved by the Engineer and shall contain not less than 4 sacks of cement per cubic yard. Concrete footings are to be crowned at the top to shed water.
  - If rock is encountered at a depth less than the embedded depth required, a 15" or larger diameter hole shall be drilled for the post and the post shall be set in concrete. If rock is encountered at a depth of 1'-6" or more below the ground surface, the hole shall be drilled to the required depth. If rock is encountered at a depth less than 1'-6" below the ground surface, the holes shall be drilled a minimum of 2'-0" into the rock or to the depth whichever is the lesser depth.
  - Barbed wire shall be in accordance with ASTM A 121 (Class 1) Design designation 12-2-4-1 4R or 12-2-5-1 4R, or as approved by the Engineer.
- Woven Wire Fence (Type B) shall be in accordance with ASTM A 116 (Class 1) No. 12-1/2 Grade 60 (See Table 1 ASTM A 116) to the height and design shown on the plans, or as approved by the Engineer.
- The location of gates and corner posts will be as indicated elsewhere on these plans.
  - Square wood posts may be used in lieu of round posts provided minimum equivalent size requirements, as shown are met. All wood posts shall be in accordance with Item 552, "Wire Fence."



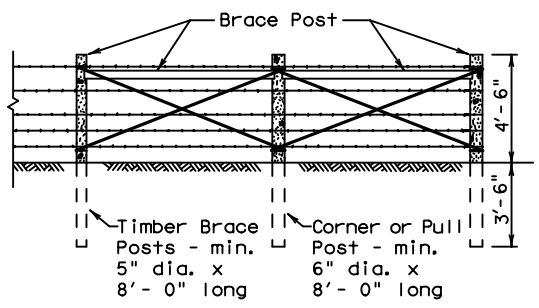
**DETAIL TYPE 1 GATE**



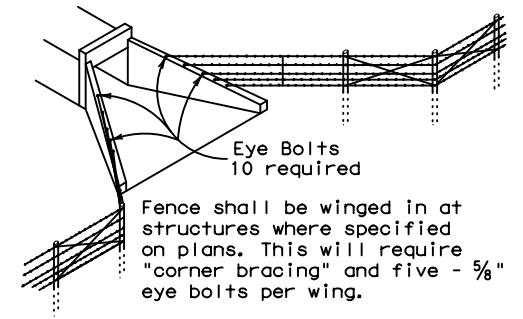
**DETAIL TYPE 2 GATE**



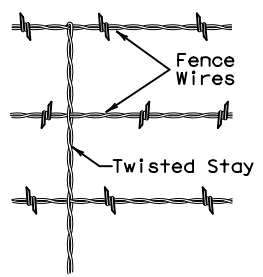
**DETAIL TYPE 3 GATE**



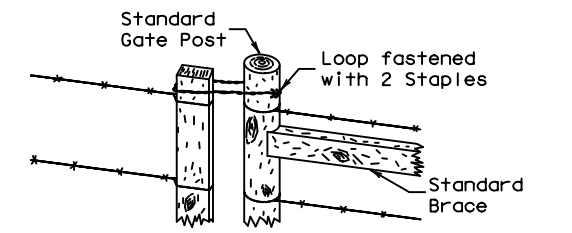
**CORNER OR PULL POST ASSEMBLY**



**DETAIL OF FENCE TREATMENT AT STRUCTURES**

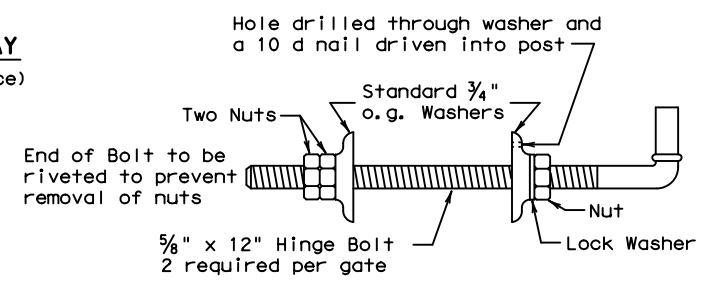


**DETAIL OF STAY**  
 (Barbed wire fence)

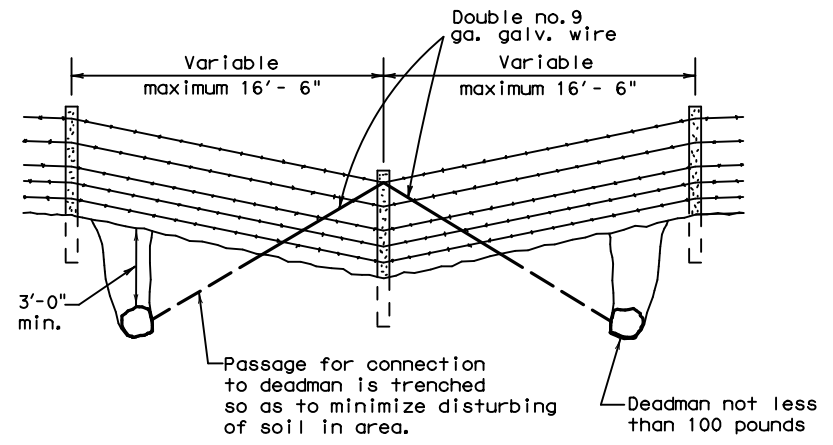


Loop to be made from two strands twisted no. 9 1/2 ga. galv. smooth wire, and to be securely fastened to gate post with two galv. staples.

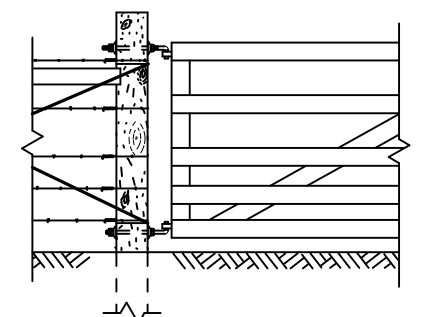
**DETAIL FASTENER TYPE 3 GATE**



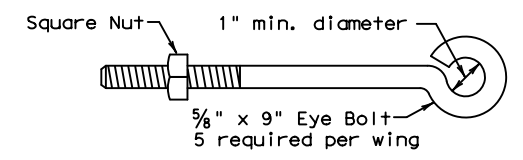
**DETAIL OF GATE HINGE BOLT ASSEMBLY**



**DETAIL OF FENCE SAG**  
 (Single Line Connection)



**DETAIL SHOWING INSTALLATION OF HINGES OF TYPE 1 & 2 GATE**



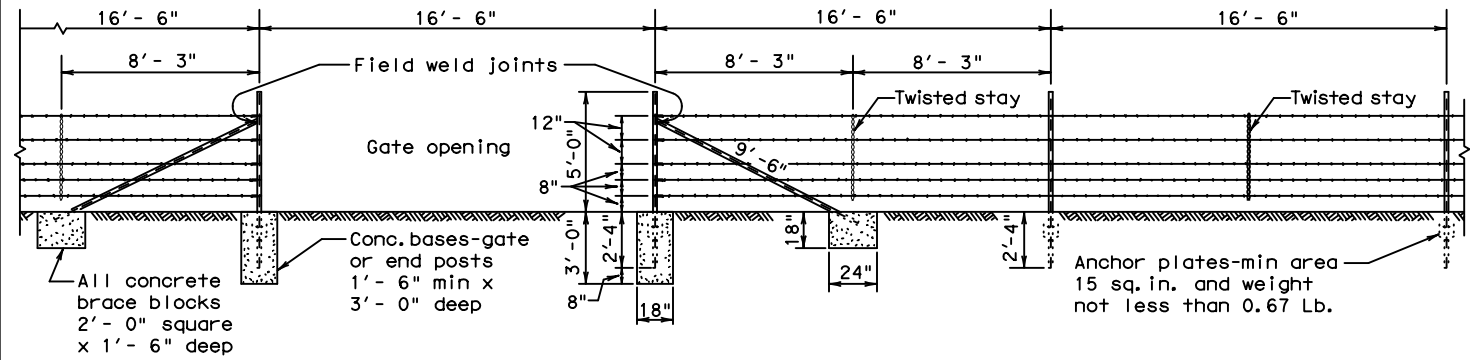
**DETAIL OF EYE BOLT**

Texas Department of Transportation  
 Design Division Standard

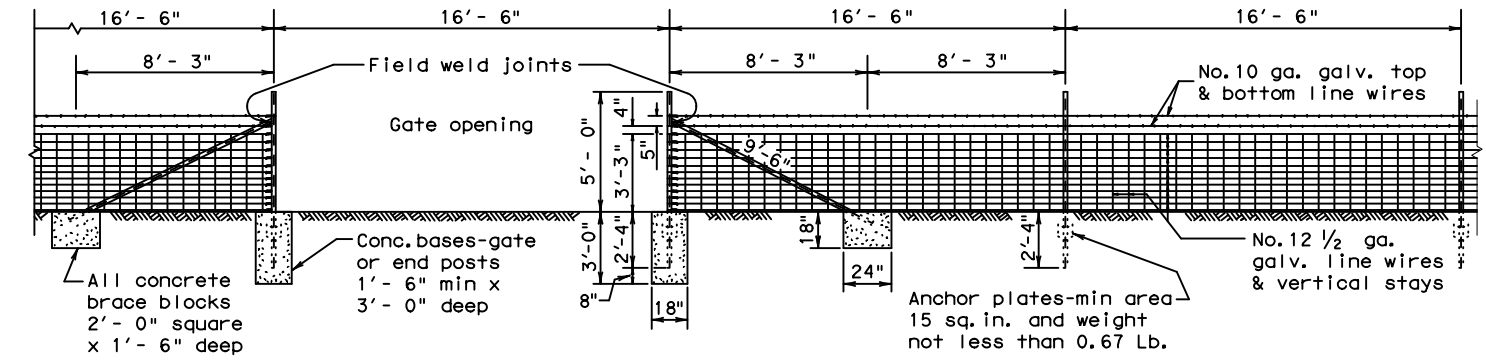
**BARBED WIRE AND WOVEN WIRE FENCE (WOOD POSTS) WF (1)-10**

FILE: wf110.dgn	DN: TxDOT	CK: AM	DW: VP	CK:
© TxDOT 1994	CONT	SECT	JOB	HIGHWAY
REVISIONS	0923	17	084	CR 392
DIST	COUNTY		SHEET NO.	
BWD	COMANCHE		33	

DATE: 12/19/2023  
 FILE: R:\1005000-1005999\1005472\_03\04\_DOCUMENTS\DESIGN\Plan\_Set\3. Roadway\Standards\wf210.dgn  
 DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.



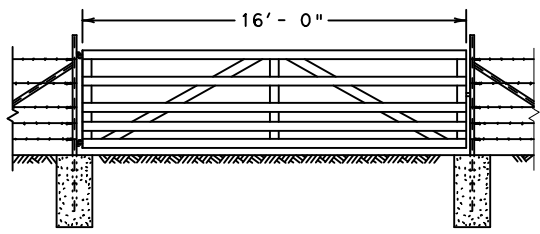
**SECTION GALVANIZED BARBED WIRE FENCE WITH METAL POSTS**  
 BRACING DETAIL USED AT ENDS AND GATES  
**TYPE "C" FENCE**  
 (See General Note 8)



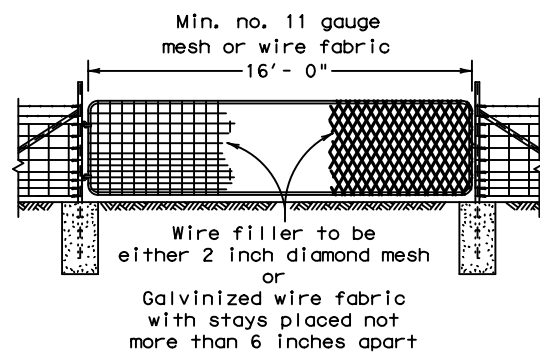
**SECTION GALVANIZED WOVEN WIRE FENCE WITH METAL POSTS**  
 BRACING DETAIL USED AT ENDS AND GATES  
**TYPE "D" FENCE**  
 (See General Note 8)

Note:  
 For Steel pipe and  
 T-Post requirements.  
 (See General Notes 6 & 7)

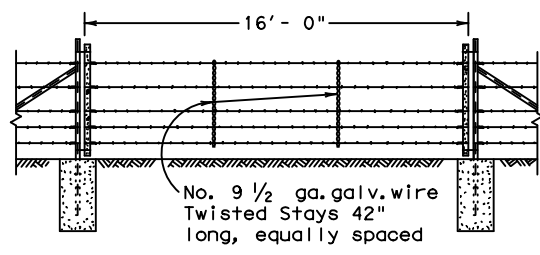
Metal gate shall consist of 5 panels not less than 4'-4" high and shall be aluminum or galvanized metal and of good quality. Gate and hardware shall meet the approval of the engineer.



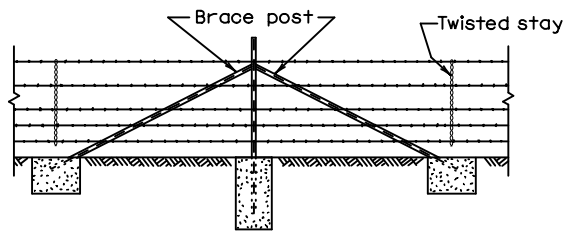
**DETAIL TYPE 1 GATE**



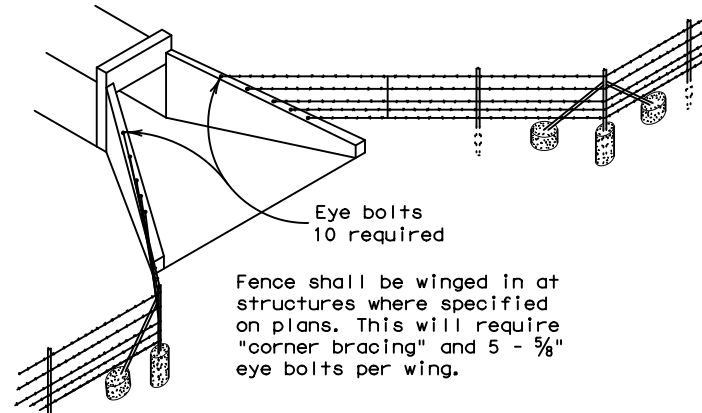
**DETAIL TYPE 2 GATE**



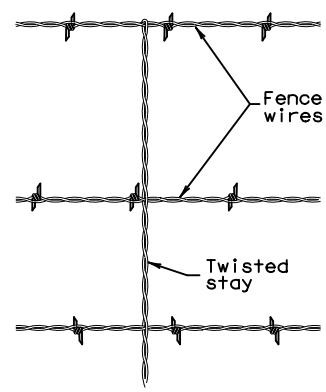
**DETAIL TYPE 3 GATE**



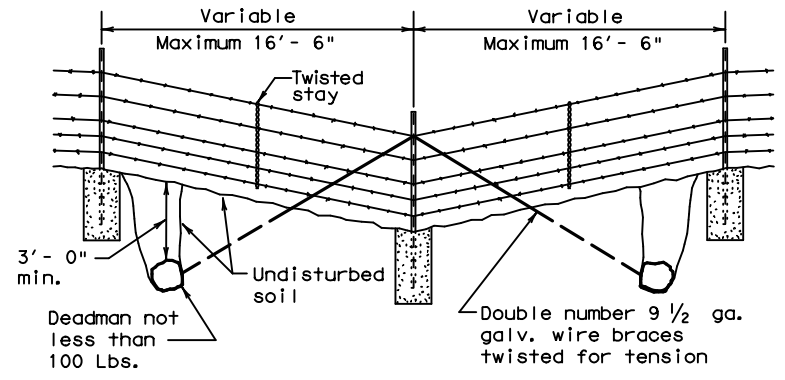
**CORNER OR PULL POST ASSEMBLY**



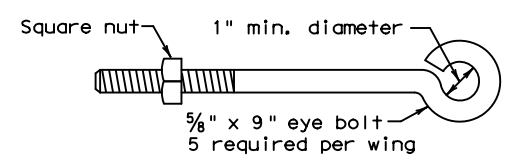
**DETAIL OF FENCE TREATMENT AT STRUCTURES**



**DETAIL OF STAY (Barbed Wire Fence)**



**DETAIL OF FENCE SAG**



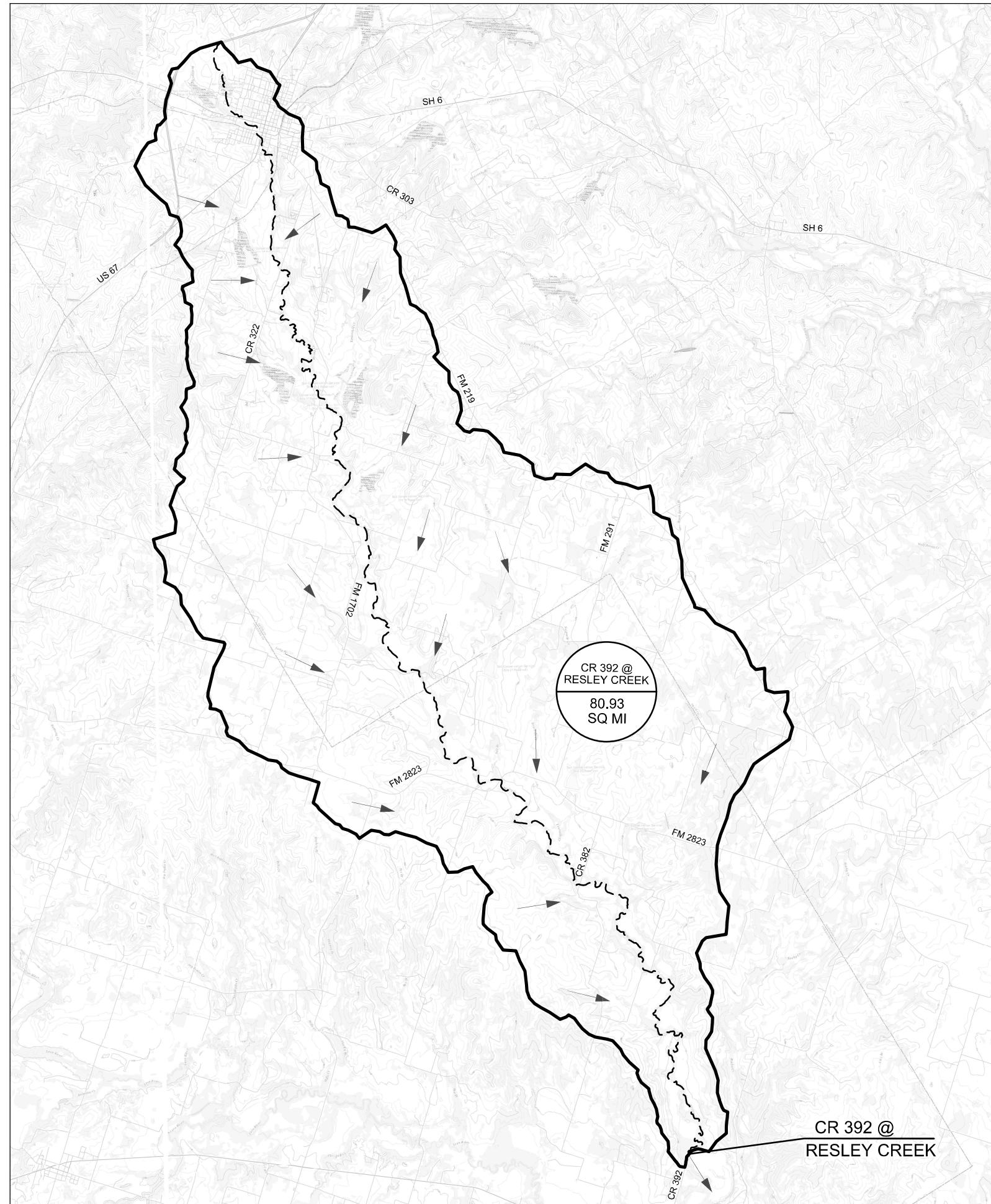
**DETAIL OF EYE BOLT**

**GENERAL NOTES**

- Any high point which interferes with the placing of wire mesh shall be excavated to provide a 2 inch clearance.
  - Latches for Type 1 and Type 2 gates shall be good commercial quality and design latch of the spring, fork or chain type. All latches shall be suitable to the gate and shall be approved by the Engineer.
  - Hinges for Type 2 gates shall be a commercial design approved by the Engineer suitable for post and gate.
  - Concrete shall be of the design and consistency approved by the Engineer and shall contain not less than 4 sacks of cement per cubic yard. Concrete footings are to be crowned at the top to shed water.
  - Steel anchor plates shall be of a design and thickness sufficient to prevent turning of the post in firm soil.
  - Steel pipe end posts, corner and pull posts shall be a minimum of 2" Std. pipe (2.375" O.D., 0.154" wall thickness) with a 1/4" Std. pipe brace (1.660" O.D., 0.140" wall thickness), with a 2"x2"x1/4" angle, or other as approved by the Engineer. Fasteners for securing barbed wire or woven wire fence to metal posts shall be a minimum of 11 gauge galvanized steel wire. Tubular posts shall be fitted with water malleable iron caps.
  - If Steel pipe is used for posts and braces, use standard pipe in accordance with ASTM A 53, Class B or A 501. For T-Posts use steel that meets ASTM A 702. Metal line posts shall be not less than 6'-6" in length and shall weigh not less than (1.33 lbs./lin.ft.). These items shall be in accordance with Item 552, "Wire Fence."
  - Barbed Wire shall be in accordance with ASTM A 121, Class 1 Design designation 12-2-4-1 4R or 12-2-5-1 4R, or as approved by the Engineer.
- Woven Wire Fence (Type D) shall be in accordance with ASTM A 116, Class 1 No. 12-1/2 Grade 60 (See Table 1 ASTM A 116) to the height and design shown on the plans, or as approved by the Engineer.
- The location of gates and corner posts will be as indicated elsewhere in these plans.

		Design Division Standard	
<b>BARBED WIRE AND WOVEN WIRE FENCE (STEEL POSTS)</b> <b>WF (2) - 10</b>			
FILE: wf210.dgn	DN: TxDOT	CK: AM	DW: VP
© TxDOT 1996	CONT	SECT	JOB
REVISIONS	0923	17	084
DIST	COUNTY		SHEET NO.
BWD	COMANCHE		34

DATE: 12/16/2023 2:45:20 PM  
 FILE: Z:\02 Engineering Projects\PCAL-7 Bridges Brownwood, TX\Work\CR 382 and CR 392\03 DRAWINGS\CR 392 Drainage Area Map Sheet.dgn



AREA = 80.93 SQ MI  
 MEAN ANNUAL PRECIPITATION = 31 IN  
 SLOPE = 0.0033 FT/FT  
 OMEGA = -0.106

OMEGA EM REGRESSION COEFFICIENTS						
RETURN INTERVAL	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
AEP (PERCENT)	50%	20%	10%	4%	2%	1%
PROBABILITY	P = 0.5	P = 0.2	P = 0.1	P = 0.04	P = 0.02	P = 0.01
a	50.98	16.62	13.62	11.79	11.17	10.82
b	-50.3	-15.32	-11.97	-9.819	-8.997	-8.448
c	1.398	1.308	1.203	1.14	1.105	1.071
d	0.27	0.372	0.403	0.446	0.476	0.507
e	0.776	0.885	0.918	0.945	0.961	0.969
LAMBDA	-0.0058	-0.0215	-0.0289	-0.0374	-0.0424	-0.0467
ESTIMATED PEAK DISCHARGES, CFS						
QT =	1893	4102	5920	8915	11613	14902

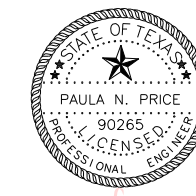
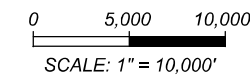
**LEGEND**

- DRAINAGE AREA ID
- AREA (AC)
- DRAINAGE FLOW DIRECTION
- DRAINAGE DIVIDE
- LONGEST FLOW PATH



**NOTES:**

- TOPOGRAPHIC CONTOUR FROM USGS 1-METER DEM (2016 BRAZOS RIVER BASIN LIDAR) AND USGS QUADRANGLE MAPS: COMYN, TX, 2022; DUBLIN, TX, 2022; ALEXANDER, TX, 2022; PROCTOR, TX, 2022; EDNA HILL, TX, 2022; CARLTON, TX, 2022; LAMKIN, TX, 2022; GENTRY MILL, TX, 2022.
- FLOWS COMPUTED USING OMEGA EM REGRESSION EQUATIONS AS PRESENTED IN TxDOT HYDRAULIC DESIGN MANUAL, CH 4, SEC 10.
- DESIGN STORM FREQUENCY IS THE 10-YR STORM AND THE CHECK STORM FREQUENCY IS THE 100-YR STORM.
- ALL CALCULATIONS IN ACCORDANCE WITH TxDOT HYDRAULIC DESIGN MANUAL, SEPT 2019.



Digitally signed by Paula N. Price,  
 P.E., CFM  
 DN: cn=Paula N. Price, P.E., CFM,  
 o=P&D Professional Services,  
 Inc., ou,  
 email=pprice@pdproservices.co  
 m, c=US  
 Date: 2023.12.16 16:40:08 -0700'



P&D PROFESSIONAL SERVICES, INC.  
 617 CAROLINE STREET, SUITE 11  
 HOUSTON, TEXAS 77002  
 281-743-4475  
 TEXAS FIRM NO. F-14117

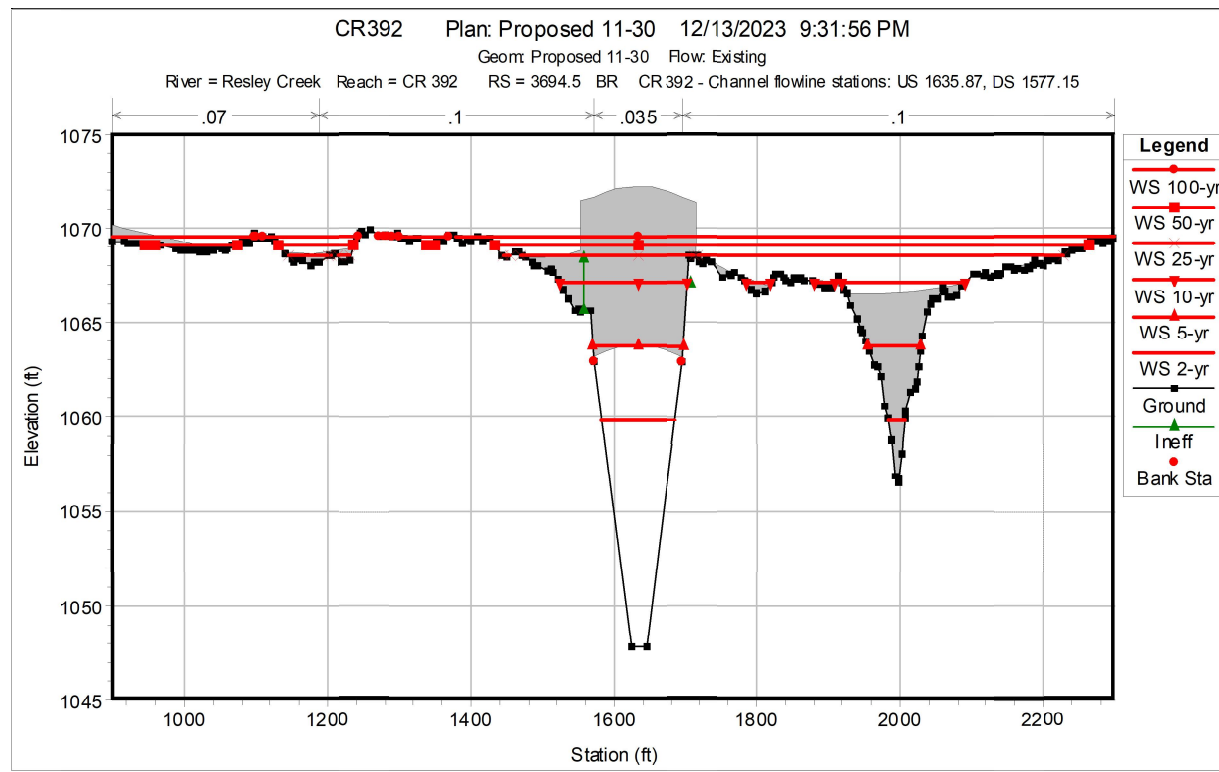
CR 392 @ RESLEY CREEK

**DRAINAGE AREA MAP**

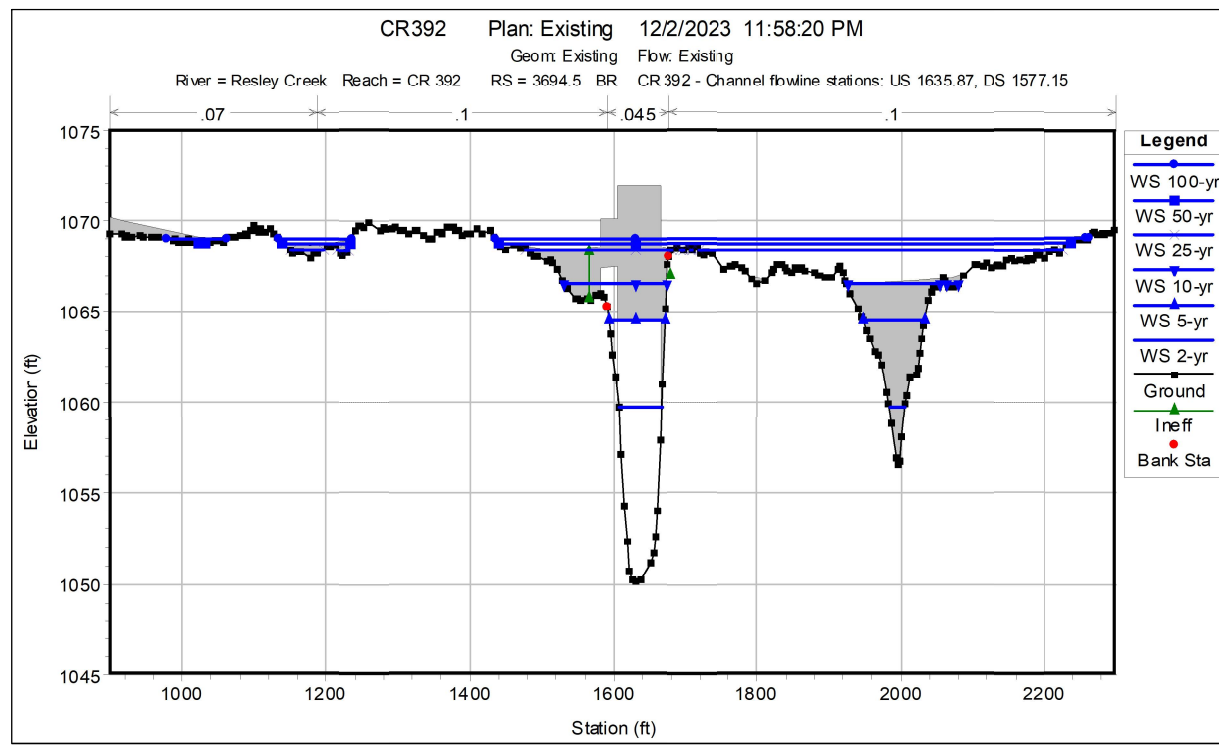
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0923	17	084	CR 392
DIST	COUNTY	SHEET NO.	
BWD	COMANCHE	35	



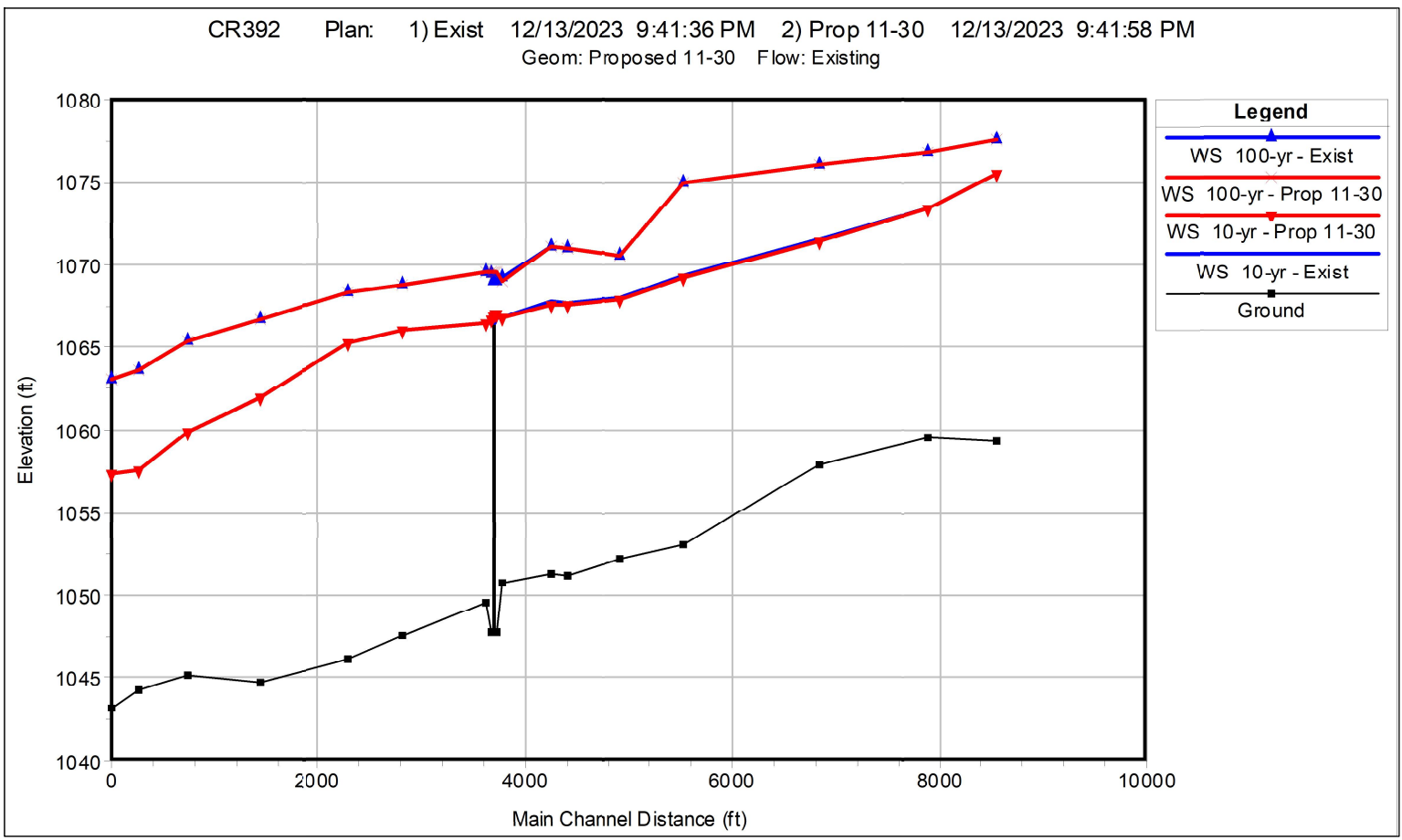
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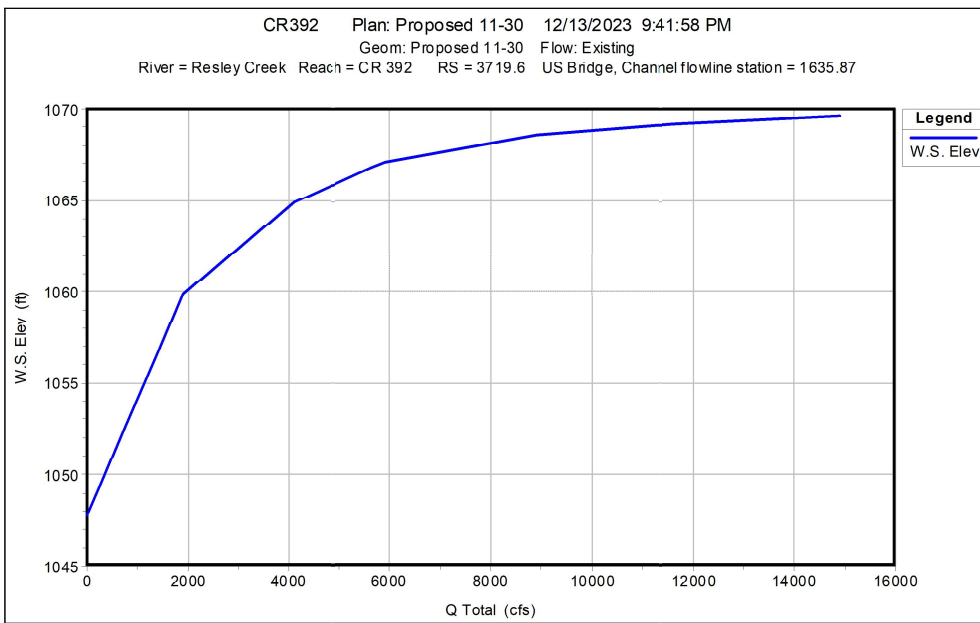
HEC-RAS CROSS SECTION OUTPUT - PROPOSED CONDITION



HEC-RAS CROSS SECTION OUTPUT - EXISTING CONDITION



HEC-RAS PROFILE OUTPUT



HEC-RAS PROPOSED CONDITION RATING CURVE

**NOTES:**

1. PROPOSED BRIDGE IS LOCATED AT HEC-RAS RS 3694.5. UPSTREAM CROSS SECTION IS AT HEC-RAS RS 3719.6 AND DOWNSTREAM CROSS SECTION IS AT HEC-RAS RS 3666.5.
2. PROPOSED BRIDGE IS PERPENDICULAR TO CHANNEL.
3. PROPOSED OVERALL BRIDGE WIDTH IS 26.0 FT. OVERALL BRIDGE LENGTH IS 125.0 FT.
4. RESLEY CREEK AT CR 392 IS NOT INCLUDED IN A FEMA FLOOD INSURANCE STUDY.

**HYDRAULIC METHOD:**

1. WATER SURFACE ELEVATIONS COMPUTED USING HEC-RAS (V 6.4.1) MODEL CREATED FOR RESLEY CREEK AT CR 392. FILENAME: CR392.prj EXIST COND PLAN: "EXISTING" PROP COND PLAN: "PROPOSED 11-30"
2. HEC-RAS CROSS SECTIONS FROM FIELD SURVEY, USGS 1 M DEM DATA AND PROPOSED BRIDGE LAYOUT.
3. HEC-RAS BOUNDARY CONDITION BASED ON NORMAL DEPTH WITH A SLOPE OF 0.0018 FT/FT.
4. MANNING'S ROUGHNESS COEFFICIENTS SET AT 0.045 FOR THE CHANNEL AND 0.05 TO 0.10 FOR THE OVERBANKS. PROPOSED STONE RIPRAP ON CHANNEL SIDE SLOPES UNDER BRIDGE SET AT 0.035.
5. ALL CALCULATIONS PERFORMED IN ACCORDANCE WITH TxDOT HYDRAULIC DESIGN MANUAL, DATED SEPTEMBER 2019.
6. ELEVATION DATUM IS NAVD 1988.
7. DESIGN STORM FREQUENCY IS 10-YR STORM. CHECK STORM FREQUENCY IS 100-YR STORM.

Digitally signed by Richard A. Kraus, PE, CFM.  
 DN: cn=Richard A. Kraus, PE, CFM, o=P&D Professional Services, Inc., ou, email=rkraus@pdproservices.com, c=US  
 Date: 2023.12.16 16:48:21 -0700

617 CAROLINE STREET, SUITE 11  
HOUSTON, TEXAS 77002  
281-743-4475  
TEXAS FIRM NO. F-14117

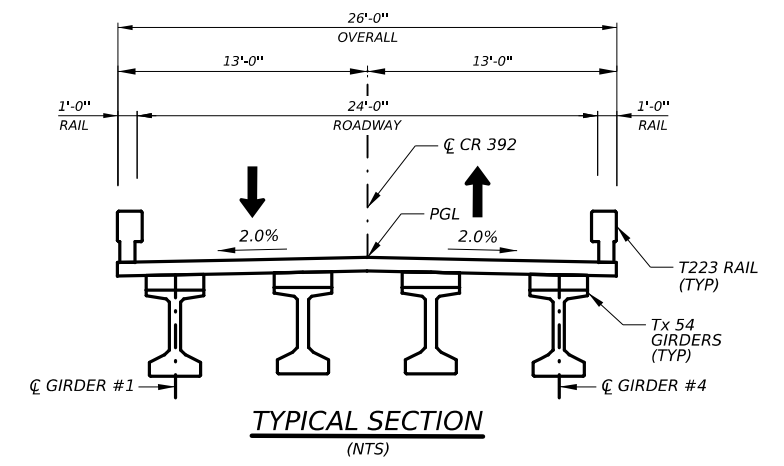
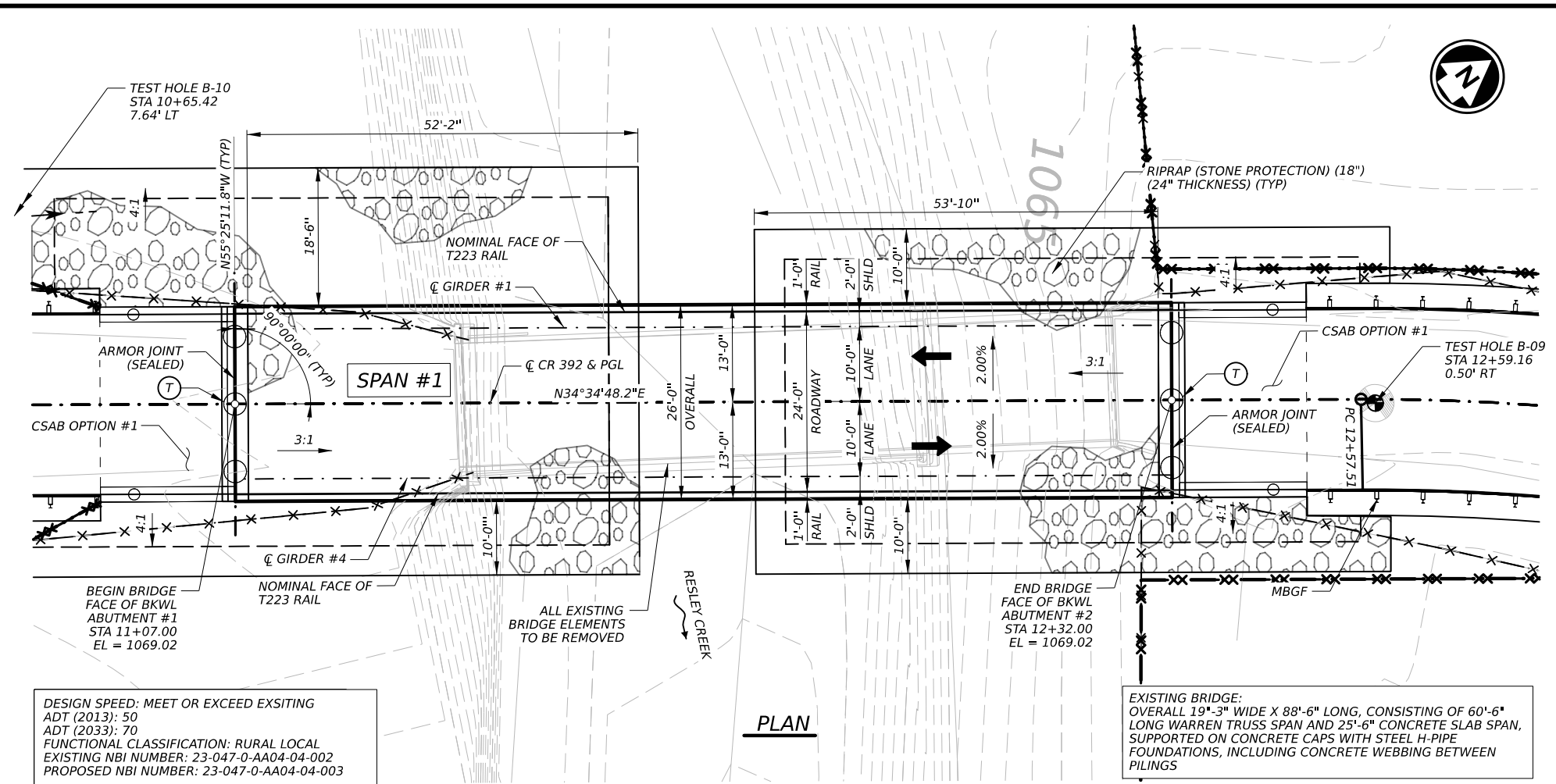
CR 392 @ RESLEY CREEK

## HYDRAULIC DATA

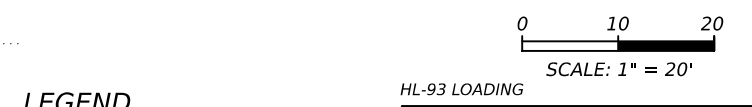
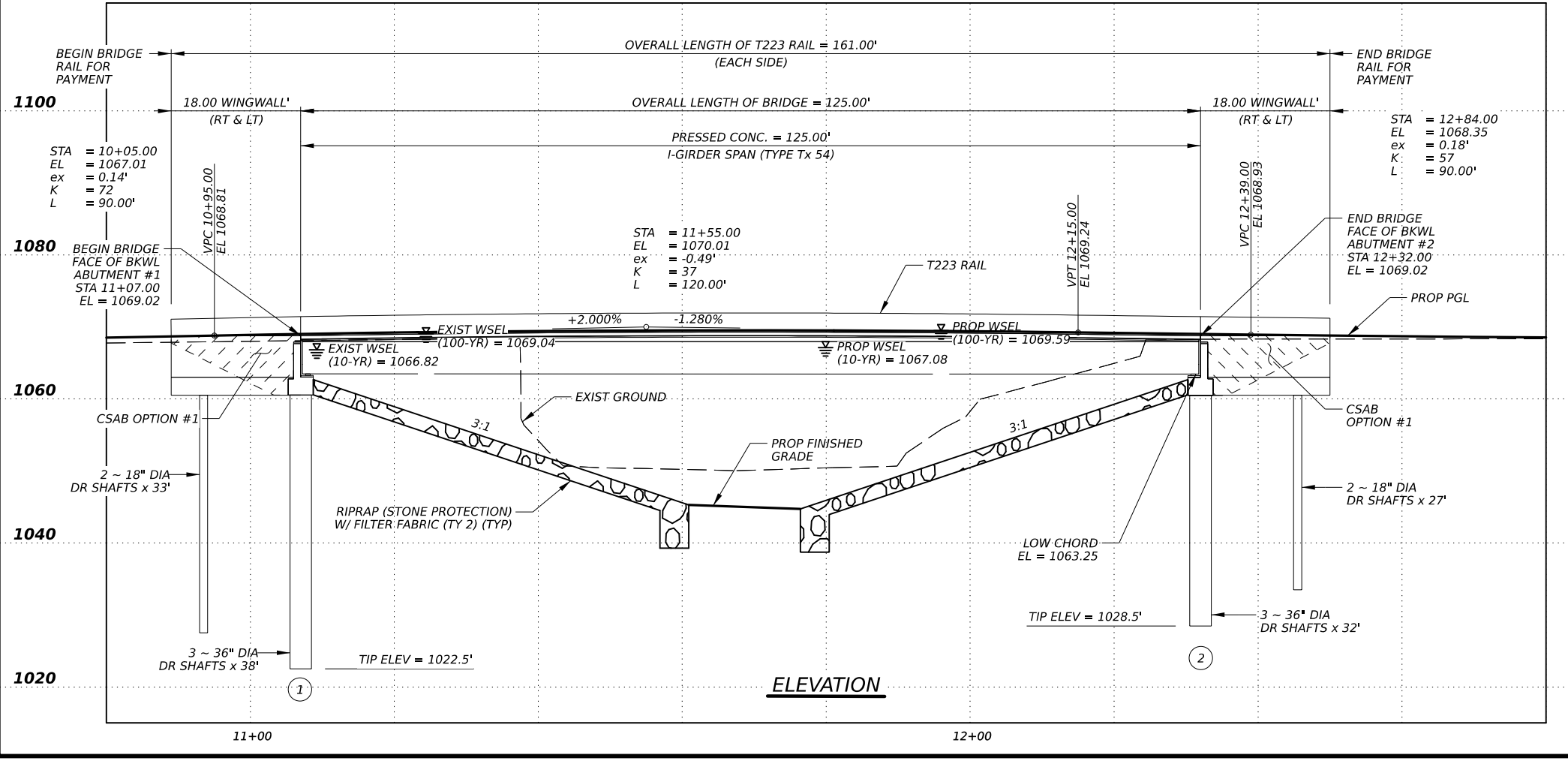
SHEET 2 OF 2

CONT	SECT	JOB	HIGHWAY
0923	17	084	CR 392
DIST		COUNTY	SHEET NO.
BWD		COMANCHE	37

DATE: 12/19/2023 4:00:40 PM  
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- GENERAL NOTES:**
- DESIGNED ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 9TH EDITION (2020), CURRENT INTERIMS AND TxDOT BRIDGE DESIGN MANUAL (JAN 2023).
  - ⊙ DENOTES SOIL BORING LOCATION. SEE "BORING LOG" SHEETS FOR BORING LOG INFORMATION.
  - UTILITIES SHOWN ARE IN APPROXIMATE LOCATIONS. CONTRACTOR SHALL VERIFY LOCATION PRIOR TO CONSTRUCTION AND INFORM ENGINEER OF ANY CONFLICTS PRIOR TO BEGINNING CONSTRUCTION.
  - ELEVATIONS SHOWN ARE AT PROFILE GRADE LINE UNLESS OTHERWISE NOTED.
  - "H" VALUES SHOWN ARE ESTIMATED AVERAGE COLUMN HEIGHTS. CONTRACTOR IS RESPONSIBLE FOR CALCULATING ACTUAL COLUMN HEIGHTS BASED ON FIELD CONDITIONS.
  - NO FUTURE WEARING SURFACE ALLOWANCE CONSIDERED IN DESIGN.
  - EXISTING CONCRETE OR STEEL FOUNDATIONS SHALL BE REMOVED 2'-0" BELOW FINISHED GROUND. ALL EXCAVATED AREAS TO BE BACKFILLED WITH NON-STRUCTURAL CONCRETE.
  - CONTRACTOR'S ATTENTION IS DIRECTED TO POTENTIAL WATER BEARING SANDY CLAY AND/OR CLAYEY SAND LAYER(S) SHOWN IN THE BORING LOGS. PROVIDE PROPER INSTALLATION METHOD FOR THE DRILLED SHAFT FOUNDATIONS, SUCH AS TEMPORARY STEEL CASING AND BENTONITE SLURRY. IT IS CONTRACTOR'S SOLE RESPONSIBILITY TO MAINTAIN THE STABILITY OF DRILLED SHAFT HOLES.
  - FOUND DRILLED SHAFTS AT THE LENGTHS SHOWN OR LONGER TO OBTAIN A MINIMUM 1.5 DRILLED SHAFT DIAMETER PENETRATION INTO DENSE SAND AND/OR SHALE.



HL-93 LOADING

SCALE: 1" = 20'

STATE OF TEXAS  
OPPIO HUNTER  
140181  
LICENSED PROFESSIONAL ENGINEER  
12/19/2023

NO.	DATE	REVISION	APPROV.

**Texas Department of Transportation**

**PGAL** 3131 Briarpark Dr, Suite 200  
Houston, Texas 77042  
(713) 622-1444  
TBPE REG. NO. F-2742

CR392 @ RESLEY CREEK

**BRIDGE LAYOUT**

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0923	17	084	CR 392
DIST	COUNTY	SHEET NO.	
BWD	COMANCHE	38	

DATE: 10/16/2023 4:26:12 PM  
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**DRILLING LOG** 1 of 2

County **Commanche** Hole **B-09** District **Brownwood**  
 WinCore Highway **CR-392** Structure **Bridge** Date **6/3/2023**  
 Version 3.3 CSJ **0923-17-084** Station **12+59.16** Grnd. Elev. **1068.37 ft**  
 Offset **0.50 RT** GW Elev. **N/A**

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test		Properties				Additional Remarks	
				Lateral Press. (psi)	Deviator Stress (psi)	MC	LL	PI	Wet Den. (pcf)		
1064.4	5	4 (6) 8 (6)	SAND, CLAYEY, gray -with calcareous nodules 0'-2' (SC)			5	29	16		-#200=39%, N=12	
					7				N=24, P=4.5+		
1054.4	15	11 (6) 14 (6)	CLAY, LEAN, WITH SAND, soft to very stiff, dark gray -with calcareous 5'-9' and 12'-14' (CL)			13				Crumb=2, P=0.5	
						5	89.7	15		115.2	P=4.5+
						8	44	27			-#200=80%, N=22, P=4.5+
1043.425	20	18 (6) 16 (6)	SAND, CLAYEY, slightly compact to compact, gray -with calcareous nodules 15'-17' and 23'-25' and ferrous traces 17'-19' (SC)			14				N=23, P=4.5+	
						8	26	12			-#200=38%, N=34, P=4.5+
						9					-#200=34%, D50=0.19mm, N=24, P=3.0
1038.430	35	50 (5) 50 (3)	CLAY, LEAN, stiff, light gray (CL)			16				N=27, Sulfate=47ppm	
						9					REC=41.7%, RQD=6.7%, P=4.5+
1028.440		50 (5) 50 (2.5)	SANDSTONE, soft, gray -with fat clay seams 35'-40'			12				REC=25%, RQD=0%, P=4.5+	
				ABUT 2 TIP ELEV = 1028.5'							

Remarks: Groundwater was encountered at a depth of 25' below existing grade during drilling. Drilling started on 6/3/2023 and ended on 6/4/2023. Survey Coordinates (TSPC, Grid, Zone 4203): Easting:2948908.42; Northing:10641372.27, Lat/Long: N31.846167749, W98.232523455  
 The ground water elevation was not determined during the course of this boring.

Driller: TGB                      Logger: DGN                      Organization: AVILES ENGINEERING CORP.  
 Z:\Engineering\Reports\2023\G107-23 Five On-Off System Replacement Bridges in Brownwood District - PGAL\Wincore\B-09.CLG

PLATE A-3

**DRILLING LOG** 2 of 2

County **Commanche** Hole **B-09** District **Brownwood**  
 WinCore Highway **CR-392** Structure **Bridge** Date **6/3/2023**  
 Version 3.3 CSJ **0923-17-084** Station **12+59.16** Grnd. Elev. **1068.37 ft**  
 Offset **0.50 RT** GW Elev. **N/A**

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test		Properties				Additional Remarks	
				Lateral Press. (psi)	Deviator Stress (psi)	MC	LL	PI	Wet Den. (pcf)		
1023.445	50	50 (2) 50 (1)	SHALE, hard, dark gray, with cemented sand layer								
						16	56	32			REC=18.3%, RQD=0%, -#200=98%, P=4.5+
50	50	50 (2) 50 (1)	SANDSTONE, hard to very hard, gray			0	48.3	15		122.2	REC=35%, RQD=7.1%, P=4.5+
								7			
55	50	50 (1) 50 (0.5)	SAND, POORLY GRADED, WITH SILT, very dense, light gray, with cemented sand seams (SP-SM)			0	260.6	8		123.3	REC=39.2%, RQD=8.3%, P=4.5+
								6			
1003.465	50	50 (0.25) 50 (0)	SANDSTONE, soft to hard, light gray -with fat clay seams 70'-75'			0	52.1	16		131.7	REC=15.8%, RQD=7.5%, P=4.5+
								5			
998.470	75	50 (4) 50 (1)									
988.480											

Remarks: Groundwater was encountered at a depth of 25' below existing grade during drilling. Drilling started on 6/3/2023 and ended on 6/4/2023. Survey Coordinates (TSPC, Grid, Zone 4203): Easting:2948908.42; Northing:10641372.27, Lat/Long: N31.846167749, W98.232523455  
 The ground water elevation was not determined during the course of this boring.

Driller: TGB                      Logger: DGN                      Organization: AVILES ENGINEERING CORP.  
 Z:\Engineering\Reports\2023\G107-23 Five On-Off System Replacement Bridges in Brownwood District - PGAL\Wincore\B-09.CLG

PLATE A-3

**NOTES**

1. BORING LOGS SHOWN ON THIS SHEET ARE WITHOUT MODIFICATION AS PRODUCED IN GEOTECHNICAL STUDY "REPORT NO. G107-23C", DATED 12/18/2023, PREPARED BY AVILES ENGINEERING CORPORATION FOR TXDOT ON CONTRACT NO. 36-01DP5091, WA#3.

Luis A. Gonzalez  
12/19/2023

NO.	DATE	REVISION	APPROV.

**Texas Department of Transportation**

TBPE REG. NO. F-2742

3131 Briarpark Dr, Suite 200  
 Houston, Texas 77042  
 (713) 622-1444

CR392 @ RESLEY CREEK

BORING LOGS

SHEET 1 OF 2

CONT	SECT	JOB	HIGHWAY
0923	17	084	CR 392
DIST	COUNTY	SHEET NO.	
BWD	COMANCHE	39	

DATE: 10/18/2023 4:26:13 PM  
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**DRILLING LOG** 1 of 2

County **Commanche** Hole **B-10** District **Brownwood**  
 WinCore Highway **CR-392** Structure **Bridge** Date **6/2/2023**  
 Version 3.3 CSJ **0923-17-084** Station **10+65.42** Grnd. Elev. **1067.22 ft**  
 Offset **7.64 LT** GW Elev. **N/A**

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test		Properties				Additional Remarks
				Lateral Press. (psi)	Deviator Stress (psi)	MC	LL	PI	Wet Den. (pcf)	
1060.2		9 (6) 12 (6)	SAND, CLAYEY, slightly compact, gray, with calcareous nodules (SC)	8		23	9			-#200=40%, N=9, P=3.25
				9						N=14, P=4.5+
1060.2			CLAY, SANDY LEAN, stiff to hard, brown -with gravel 23'-25' (CL)	0	29.9	14			114.9	P=4.5+
10	22 (6) 25 (6)	9		32	18				-#200=70%, D.Hydro=20.6%, P=4.5+	
		11							N=18, Crumb=3, P=4.5+	
15	15 (6) 18 (6)	12							N=31, P=4.5+	
		14		37	23				-#200=64%, N=27, P=4.5+	
20	19 (6) 19 (6)	12							N=31, P=4.5+	
		11						N=32, Crumb=1, P=4.5+		
25		33 (6) 27 (6)						-#200=69%, N=36, P=4.5+		
30		50 (4) 50 (1)							N=50/6", P=4.5+	
1032.235		50 (1) 50 (0.5)	SAND, very dense							N=50/6", P=4.5+
1027.240										NO RECOVERY

Remarks: Wet rotary started at 35' before encountering groundwater during drilling. Drilling started on 6/2/2023 and ended on 6/3/2023.  
 Survey Coordinates (TSPC, Grid, Zone 4203): Easting: 2948791.76; Northing: 10641217.38, Lat/Long: N31.845748139, W98.232908489  
 The ground water elevation was not determined during the course of this boring.

Driller: TGB      Logger: DGN      Organization: AVILES ENGINEERING CORP.  
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PLATE A-4

**DRILLING LOG** 2 of 2

County **Commanche** Hole **B-10** District **Brownwood**  
 WinCore Highway **CR-392** Structure **Bridge** Date **6/2/2023**  
 Version 3.3 CSJ **0923-17-084** Station **10+65.42** Grnd. Elev. **1067.22 ft**  
 Offset **7.64 LT** GW Elev. **N/A**

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test		Properties				Additional Remarks
				Lateral Press. (psi)	Deviator Stress (psi)	MC	LL	PI	Wet Den. (pcf)	
50	(1) 50 (3)		SAND, CLAYEY, very dense, light gray (SC)			25				-#200=56%, N=50/3", P=0.25
										N=50/3"
45		50 (0) 50 (0)	ABUT 1 TIP ELEV = 1022.5'			32				N=50/3"
										N=50/3"
1016.2		50 (0.5) 50 (0.5)	SANDSTONE, hard, gray -with conglomerate clay layers 52'-60'							
55		50 (2) 50 (0.5)								
1007.260		50 (0.25) 50 (0.25)	SANDSTONE, very hard	0	193.1	5			131.9	REC=30.1%, RQD=5.7%, P=4.5+
										NO RECOVERY
1002.265		50 (0.25) 50 (0.25)	SANDSTONE, very hard, gray -vuggy 70'-75', laminated with gray shale 75'-80'							
70		50 (0.25) 50 (0.25)								REC=10.8%, RQD=10.8%, -#200=33%, D50=0.13mm, P=4.5+
										REC=45%, RQD=9.2%, P=4.5+
75		50 (1) 50 (0.5)								REC=42.5%, RQD=6.7%, P=4.5+
										TD=80'
987.2	80									

Remarks: Wet rotary started at 35' before encountering groundwater during drilling. Drilling started on 6/2/2023 and ended on 6/3/2023.  
 Survey Coordinates (TSPC, Grid, Zone 4203): Easting: 2948791.76; Northing: 10641217.38, Lat/Long: N31.845748139, W98.232908489  
 The ground water elevation was not determined during the course of this boring.

Driller: TGB      Logger: DGN      Organization: AVILES ENGINEERING CORP.  
 Z:\Engineering\Reports\2023\G107-23 Five On-Off System Replacement Bridges in Brownwood District - PGAL\Wincore\B-10.CLG

PLATE A-4

**NOTES**

1. BORING LOGS SHOWN ON THIS SHEET ARE WITHOUT MODIFICATION AS PRODUCED IN GEOTECHNICAL STUDY "REPORT NO. G107-23C", DATED 12/18/2023, PREPARED BY AVILES ENGINEERING CORPORATION FOR TXDOT ON CONTRACT NO. 36-01DP5091, WA#3.

*Luis A. Gonzalez*

NO.	DATE	REVISION	APPROV.

**Texas Department of Transportation**  
 PGAL TBPE REG. NO. F-2742      3131 Briarpark Dr, Suite 200  
 Houston, Texas 77042  
 (713) 622-1444

CR392 @ RESLEY CREEK

## BORING LOGS

SHEET 2 OF 2

CONT	SECT	JOB	HIGHWAY
0923	17	084	CR 392
DIST	COUNTY	SHEET NO.	
BWD	COMANCHE	40	



DN: DW: CK: CK: DW: CK:

SUMMARY OF ESTIMATED BRIDGE QUANTITIES

ITEM	400 6005	402 6001	416 6001	416 6004	420 6013	422 6001	425 6039	432 6033	450 6006	454 6004	4021 6001
DESCRIPTION	CEM STABIL BKFL	TRENCH EXCAVATION PROTECTION	DRILL SHAFT (18 IN)	DRILL SHAFT (36 IN)	* CL C CONC (ABUT)	REINF CONC SLAB	PRESTR CONC GIRDER (TX54)	** RIPRAP (STONE PROTECTION) (18 IN)	RAIL (TY T223)	ARMOR JOINT (SEALED)	*** TIP TESTING (DRILL SHAFT)
UNIT	CY	LF	LF	LF	CY	SF	LF	CY	LF	LF	EA
ABUTMENT 1	69	60	80	135	27.6			416.9	36.0	23	1
ABUTMENT 2	69	60	70	120	27.6			363.4	36.0	23	1
125.00 PRSTR CONC I-GIRDER UNIT						3,250	498.00		250.0		
OVERALL TOTAL	138	120	150	255	55.2	3,250	498.00	780.3	322	46	2

\* ABUTMENT CONC QUANTITY INCLUDES THE SHEAR KEY VOLUME

\*\* FILTER FABRIC (TY 2) REQUIRED UNDERNEATH SRR, THIS IS SUBSIDIARY TO ITEM 432.

\*\*\* DRILLED SHAFT TESTING NOTES:

THERMAL INTEGRITY PROFILER (TIP) TESTING OF DRILLED SHAFT (SS 4021-6004) PERFORM THE NONDESTRUCTIVE TESTING (NDT) METHOD TERMED TIP TESTING TO CHECK THE INTEGRITY OF DESIGNATED PRODUCTION DRILLED SHAFTS AS SHOWN ON PLANS. COORDINATE TESTING WITH THE ENGINEER A MINIMUM OF ONE WEEK PRIOR TO THE DESIRED TESTING DATE.

BEARING SEAT ELEVATIONS

	BEAM 1	BEAM 2	BEAM 3	BEAM 4
ABUT 1 (FWD)	1063.118	1063.251	1063.251	1063.118
	BEAM 1	BEAM 2	BEAM 3	BEAM 4
ABUT 2 (BK)	1063.104	1063.237	1063.237	1063.104

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1/23/2024

NO.	DATE	REVISION	APPROV.



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CR 392 @ RESLEY CREEK

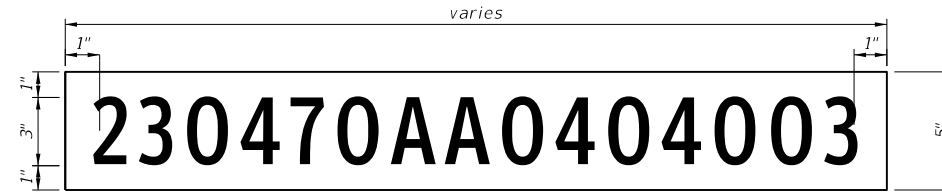
## ESTIMATED QUANTITIES & BEARING SEAT ELEVATIONS

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0923	17	084	CR 392
DIST	COUNTY	SHEET NO.	
BWD	COMANCHE	41	

KEYED NOTES

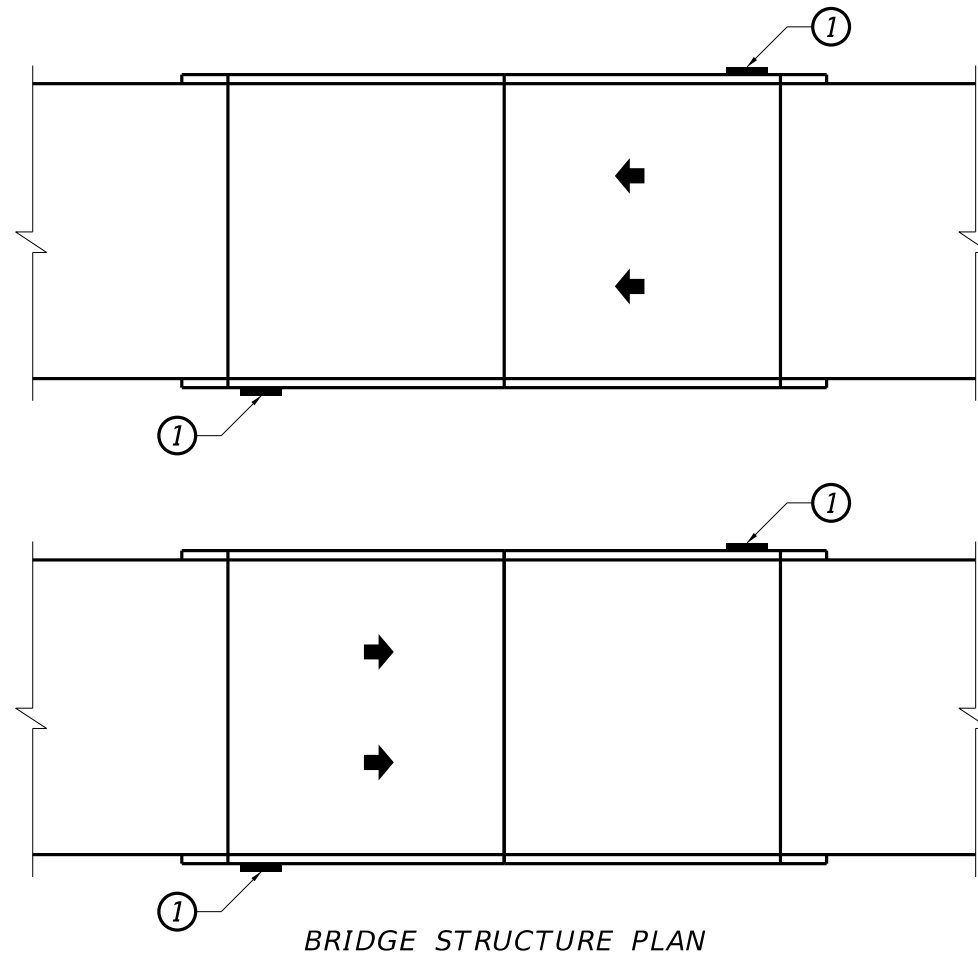
- ① Proposed painted bridge identification number.



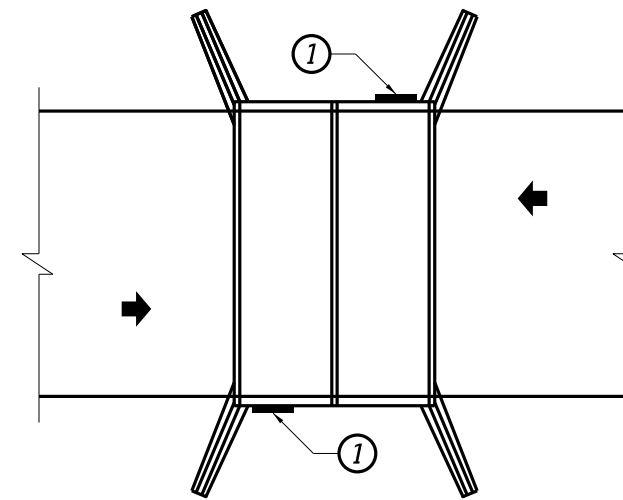
BRIDGE IDENTIFICATION NUMBER DETAILS

GENERAL NOTES

1. Obtain approval of proposed materials and work methods before commencing work.
2. Paints shall be waterproof, weather resistant, and quick drying when used on concrete without smearing, smudging or rippling.
3. Metal stencil set shall have 3 in. interlocking characters, shall include numbers, letters and dashes, and shall have font as approved. C H Hanson stencil set model 10153 or equal.
4. Painted bridge identification numbers shall have white background with black letters. Borders shall be 1 in. minimum. Mask to prevent overspray.
5. For bridge structures, apply painted bridge identification numbers on both sides of structure, except for parallel structures which are only separated by an expansion joint. Apply to each outside edge of concrete deck close to abutment on the upstream traffic side unless otherwise approved.
6. For culvert structures, apply painted bridge identification numbers on both sides of structure. Apply to each headwall adjacent to wingwall on the upstream traffic side unless otherwise approved.
7. The Engineer will provide guidance in cases where painted bridge identification numbers cannot be installed in standard locations.
8. Unless identified in the contract as bid items, painted bridge identification numbers will not be measured and paid for directly, but will be considered as subsidiary to the various bid items of the contract. Submit digital photographs of each new painted bridge identification number to the bridge inspection coordinator. Include the following information visible within the digital photographs: date, latitude, longitude, and direction.



BRIDGE STRUCTURE PLAN



CULVERT STRUCTURE PLAN

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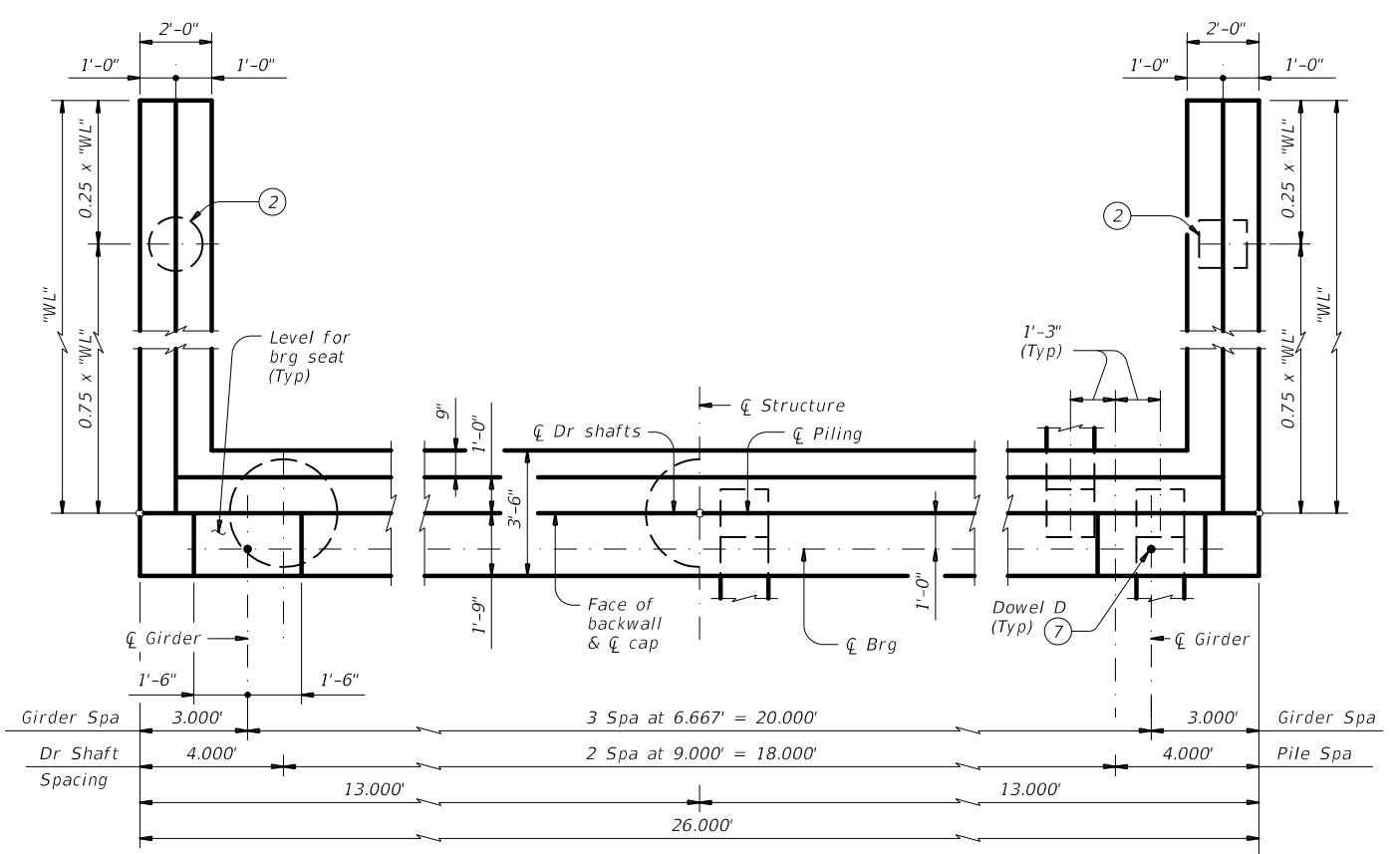
CR 392  
 BRIDGE  
 IDENTIFICATION  
 NUMBER



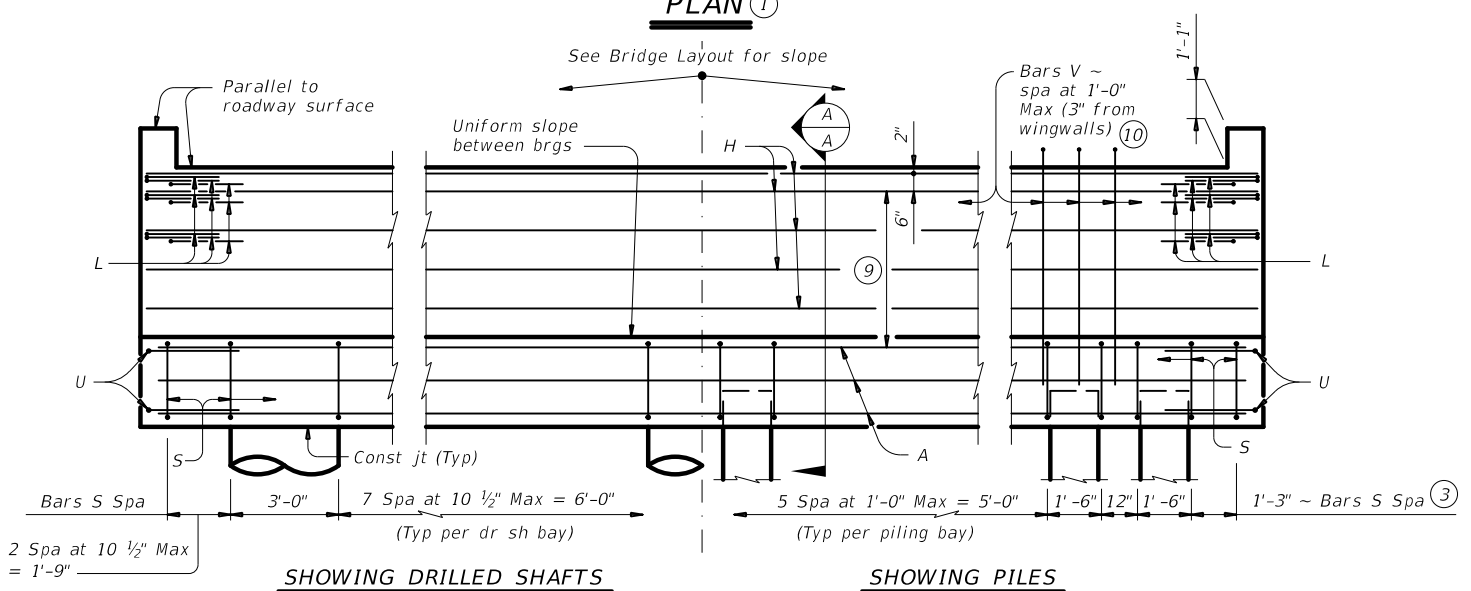
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0923	17	084	CR 392
DIST		COUNTY	SHEET NO.
BWD		COMANCHE	42

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TABLE OF FOUNDATION LOADS		
Span Length	All Girder Types	
	Tons/Shaft	Tons/Pile
40	64	54
45	69	56
50	73	59
55	77	61
60	81	63
65	85	65
70	88	67
75	92	69
80	96	71
85	100	73
90	104	75
95	108	77
100	111	79
105	115	80
110	119	82
115	123	84
120	126	86
125	130	88



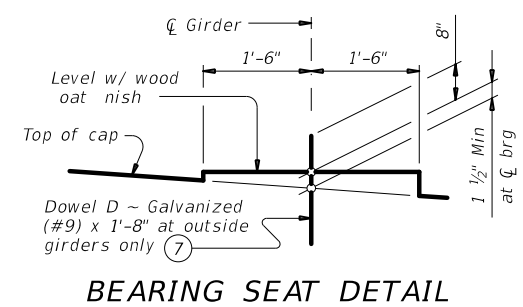
SHOWING DRILLED SHAFTS      SHOWING PILES



SHOWING DRILLED SHAFTS      SHOWING PILES

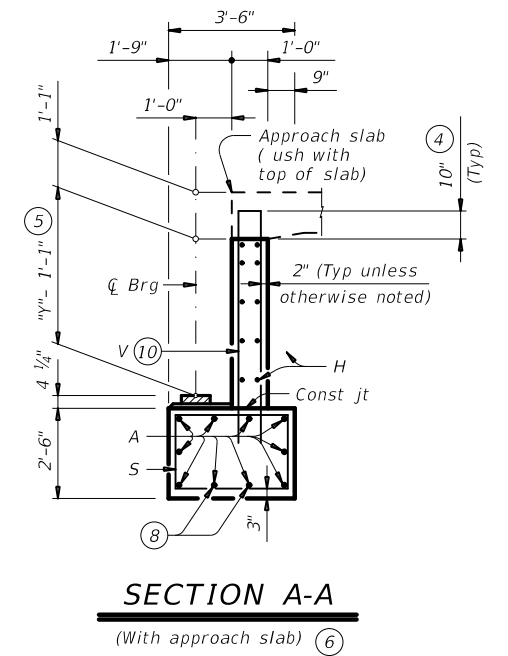
Header Slope	Girder Type	Wingwall Type	Wingwall Lgth "WL"
2:1	Tx28	Cantilevered	8.000'
	Tx34	Cantilevered	9.000'
	Tx40	Cantilevered	10.000'
	Tx46	Cantilevered	11.000'
3:1	Tx54	Cantilevered	12.000'
	Tx28	Cantilevered	12.000'
	Tx34	Founded	13.000'
	Tx40	Founded	15.000'
	Tx46	Founded	16.000'
	Tx54	Founded	18.000'

ELEVATION



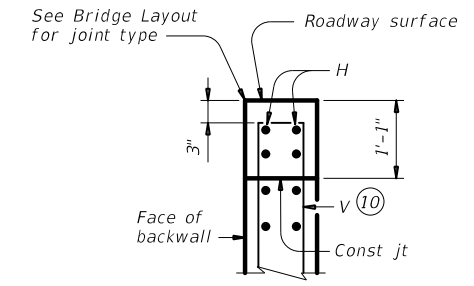
BEARING SEAT DETAIL

(Bearing surface must be clean and free of all loose material before placing bearing pad.)



SECTION A-A

(With approach slab) ⑥



BACKWALL DETAIL

(Without approach slab) ⑥

- ① See Table A for variable dimensions based on header slope and girder type.
- ② See Table A to determine if wingwall foundations are required.
- ③ For piling larger than 16" adjust Bars S spacing as required to avoid piling.
- ④ Increase as required to maintain 3" from nished grade.
- ⑤ See Span details for "y" value.
- ⑥ See Bridge Layout to determine if approach slab is present.
- ⑦ Omit Dowels D at end of multi-span unit. Adjust reinforcing steel total accordingly.
- ⑧ With pile foundations, move Bars A shown to clear piles.
- ⑨ Spacing based on girder type:  
 Tx28 ~ 3 spaces at 1'-0" Max  
 Tx34 ~ 3 spaces at 1'-0" Max  
 Tx40 ~ 4 spaces at 1'-0" Max  
 Tx46 ~ 4 spaces at 1'-0" Max  
 Tx54 ~ 5 spaces at 1'-0" Max
- ⑩ Field bend as needed to clear piles.

**GENERAL NOTES:**  
 Designed according to AASHTO LRFD Bridge Design Specifications.  
 See Bridge Layout for header slope and foundation type, size and length.  
 See Common Foundation Details (FD) standard sheet for all foundation details and notes.  
 See Concrete Riprap (CRR) standard sheet or Stone Riprap (SRR) standard sheet for riprap attachment details, if applicable.  
 See applicable rail details for rail anchorage in wingwalls.  
 These abutment details may be used with standard SIG-24 only.

Cover dimensions are clear dimensions, unless noted otherwise.  
 Reinforcing bar dimensions shown are out-to-out of bar.

**MATERIAL NOTES:**  
 Provide Class C concrete (f'c = 3,600 psi).  
 Provide Class C (HPC) concrete if shown elsewhere in the plans.  
 Provide Grade 60 reinforcing steel.  
 Galvanize dowel bars D.

HL93 LOADING      SHEET 1 OF 3

**Bridge Division Standard**

## ABUTMENTS

### TYPE TX28 THRU TX54

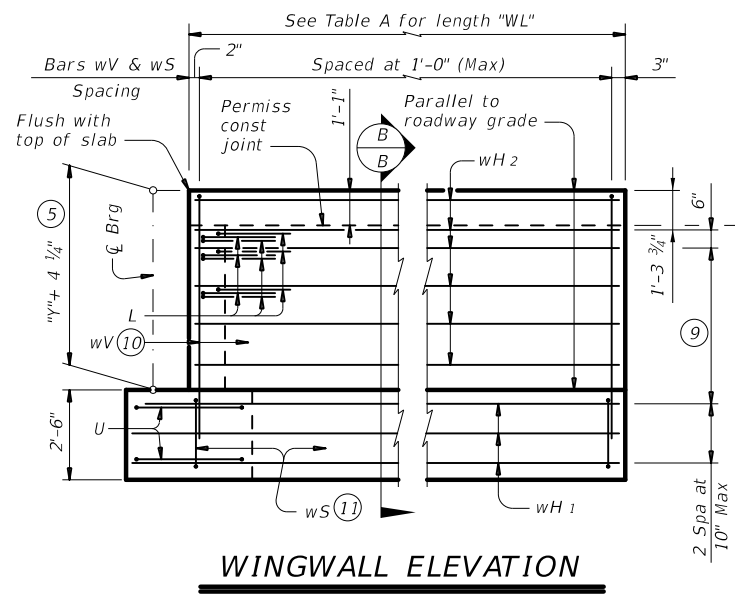
### PRESTR CONC I-GIRDERS

### 24' ROADWAY

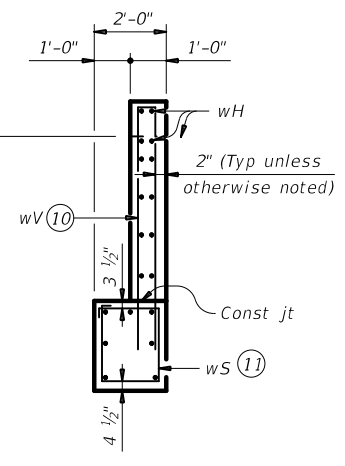
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	DIST	COUNTY	SHEET NO.	
	BWD	COMANCHE	43	

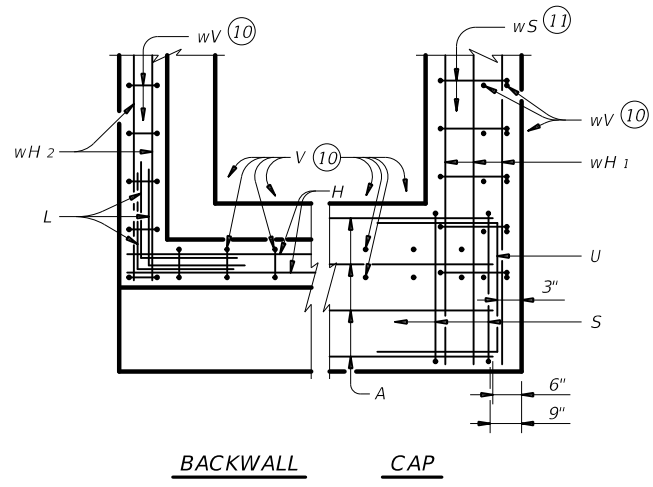
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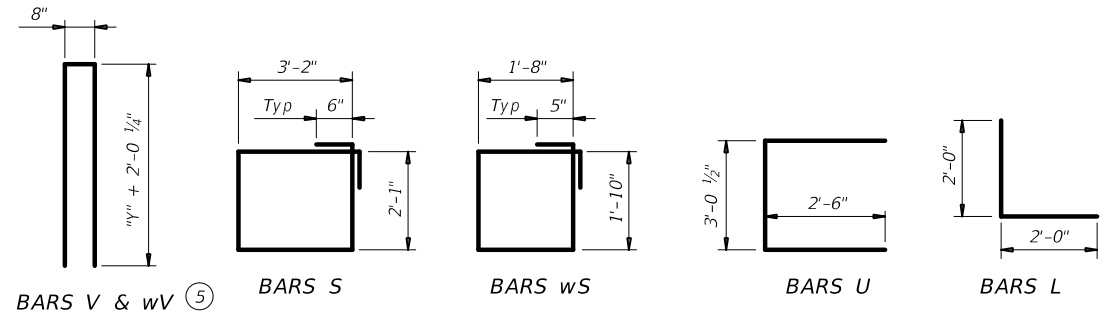
**WINGWALL ELEVATION**



**SECTION B-B**



**BACKWALL CAP CORNER DETAILS**



- (5) See Span details for "y" value.
- (9) Spacing based on girder type:  
 Tx28 ~ 3 spaces at 1'-0" Max  
 Tx34 ~ 3 spaces at 1'-0" Max  
 Tx40 ~ 4 spaces at 1'-0" Max  
 Tx46 ~ 4 spaces at 1'-0" Max  
 Tx54 ~ 5 spaces at 1'-0" Max
- (10) Field bend as needed to clear piles.
- (11) Adjust as required to avoid piling.

		<b>Bridge Division Standard</b>	
<b>ABUTMENTS</b> TYPE TX28 THRU TX54 PRESTR CONC I-GIRDERS 24' ROADWAY			
<b>AIG-24</b>			
FILE: IG-AIG2400-17.dgn	DN: TAR	CK: KCM	DW: JTR
©TxDOT August 2017	CONT SECT	JOB	HIGHWAY
REVISIONS	0923 17	084	CR 392
DIST	COUNTY	SHEET NO.	
BWD	COMANCHE	44	

12/19/2023 4:00:51 PM  
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 FILE:

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**TABLES OF ESTIMATED QUANTITIES WITH 2:1 HEADER SLOPE <sup>(12)</sup>**

TYPE Tx28 Girders					TYPE Tx34 Girders					TYPE Tx40 Girders					TYPE Tx46 Girders					TYPE Tx54 Girders									
Bar	No.	Size	Length	Weight	Bar	No.	Size	Length	Weight	Bar	No.	Size	Length	Weight	Bar	No.	Size	Length	Weight	Bar	No.	Size	Length	Weight					
A	10	#11	25'-0"	1,328	A	10	#11	25'-0"	1,328	A	10	#11	25'-0"	1,328	A	10	#11	25'-0"	1,328	A	10	#11	25'-0"	1,328					
D <sup>(7)</sup>	2	#9	1'-8"	11	D <sup>(7)</sup>	2	#9	1'-8"	11	D <sup>(7)</sup>	2	#9	1'-8"	11	D <sup>(7)</sup>	2	#9	1'-8"	11	D <sup>(7)</sup>	2	#9	1'-8"	11					
H	8	#6	25'-8"	308	H	8	#6	25'-8"	308	H	10	#6	25'-8"	386	H	10	#6	25'-8"	386	H	12	#6	25'-8"	463					
L	18	#6	4'-0"	108	L	18	#6	4'-0"	108	L	18	#6	4'-0"	108	L	18	#6	4'-0"	108	L	18	#6	4'-0"	108					
S	22	#5	11'-6"	264	S	22	#5	11'-6"	264	S	22	#5	11'-6"	264	S	22	#5	11'-6"	264	S	22	#5	11'-6"	264					
U	4	#6	8'-1"	49	U	4	#6	8'-1"	49	U	4	#6	8'-1"	49	U	4	#6	8'-1"	49	U	4	#6	8'-1"	49					
V	25	#5	11'-4"	296	V	25	#5	12'-4"	322	V	25	#5	13'-4"	348	V	25	#5	14'-4"	374	V	25	#5	15'-8"	409					
wH1	14	#6	9'-5"	198	wH1	14	#6	10'-5"	219	wH1	14	#6	11'-5"	240	wH1	14	#6	12'-5"	261	wH1	14	#6	13'-5"	282					
wH2	20	#6	7'-8"	230	wH2	20	#6	8'-8"	260	wH2	24	#6	9'-8"	348	wH2	24	#6	10'-8"	385	wH2	28	#6	11'-8"	491					
wS	18	#4	7'-10"	94	wS	20	#4	7'-10"	105	wS	22	#4	7'-10"	115	wS	24	#4	7'-10"	126	wS	26	#4	7'-10"	136					
wV	18	#5	11'-4"	213	wV	20	#5	12'-4"	257	wV	22	#5	13'-4"	306	wV	24	#5	14'-4"	359	wV	26	#5	15'-8"	425					
Reinforcing Steel				Lb	3,099	Reinforcing Steel				Lb	3,231	Reinforcing Steel				Lb	3,503	Reinforcing Steel				Lb	3,651	Reinforcing Steel				Lb	3,966
Class "C" Concrete				CY	15.2	Class "C" Concrete				CY	16.6	Class "C" Concrete				CY	18.1	Class "C" Concrete				CY	19.7	Class "C" Concrete				CY	21.6

**TABLES OF ESTIMATED QUANTITIES WITH 3:1 HEADER SLOPE <sup>(12)</sup>**

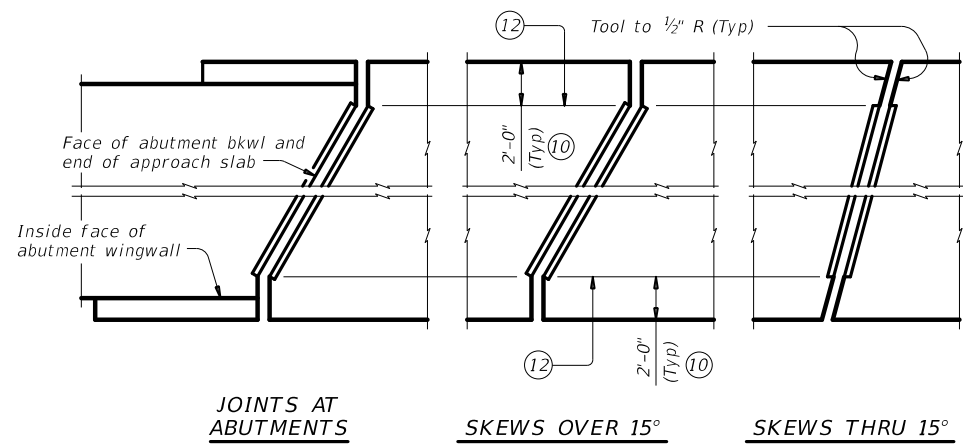
TYPE Tx28 Girders					TYPE Tx34 Girders					TYPE Tx40 Girders					TYPE Tx46 Girders					TYPE Tx54 Girders									
Bar	No.	Size	Length	Weight	Bar	No.	Size	Length	Weight	Bar	No.	Size	Length	Weight	Bar	No.	Size	Length	Weight	Bar	No.	Size	Length	Weight					
A	10	#11	25'-0"	1,328	A	10	#11	25'-0"	1,328	A	10	#11	25'-0"	1,328	A	10	#11	25'-0"	1,328	A	10	#11	25'-0"	1,328					
D <sup>(7)</sup>	2	#9	1'-8"	11	D <sup>(7)</sup>	2	#9	1'-8"	11	D <sup>(7)</sup>	2	#9	1'-8"	11	D <sup>(7)</sup>	2	#9	1'-8"	11	D <sup>(7)</sup>	2	#9	1'-8"	11					
H	8	#6	25'-8"	308	H	8	#6	25'-8"	308	H	10	#6	25'-8"	386	H	10	#6	25'-8"	386	H	12	#6	25'-8"	463					
L	18	#6	4'-0"	108	L	18	#6	4'-0"	108	L	18	#6	4'-0"	108	L	18	#6	4'-0"	108	L	18	#6	4'-0"	108					
S	22	#5	11'-6"	264	S	22	#5	11'-6"	264	S	22	#5	11'-6"	264	S	22	#5	11'-6"	264	S	22	#5	11'-6"	264					
U	4	#6	8'-1"	49	U	4	#6	8'-1"	49	U	4	#6	8'-1"	49	U	4	#6	8'-1"	49	U	4	#6	8'-1"	49					
V	25	#5	11'-4"	296	V	25	#5	12'-4"	322	V	25	#5	13'-4"	348	V	25	#5	14'-4"	374	V	25	#5	15'-8"	409					
wH1	14	#6	13'-5"	282	wH1	14	#6	14'-5"	303	wH1	14	#6	16'-5"	345	wH1	14	#6	17'-5"	366	wH1	14	#6	19'-5"	408					
wH2	20	#6	11'-8"	350	wH2	20	#6	12'-8"	381	wH2	24	#6	14'-8"	529	wH2	24	#6	15'-8"	565	wH2	28	#6	17'-8"	743					
wS	26	#4	7'-10"	136	wS	28	#4	7'-10"	147	wS	32	#4	7'-10"	167	wS	34	#4	7'-10"	178	wS	38	#4	7'-10"	199					
wV	26	#5	11'-4"	307	wV	28	#5	12'-4"	360	wV	32	#5	13'-4"	445	wV	34	#5	14'-4"	508	wV	38	#5	15'-8"	621					
Reinforcing Steel				Lb	3,439	Reinforcing Steel				Lb	3,581	Reinforcing Steel				Lb	3,980	Reinforcing Steel				Lb	4,137	Reinforcing Steel				Lb	4,603
Class "C" Concrete				CY	17.8	Class "C" Concrete				CY	19.3	Class "C" Concrete				CY	21.7	Class "C" Concrete				CY	23.4	Class "C" Concrete				CY	26.4

<sup>(7)</sup> Omit Dowels D at end of multi-span unit. Adjust reinforcing steel total accordingly.

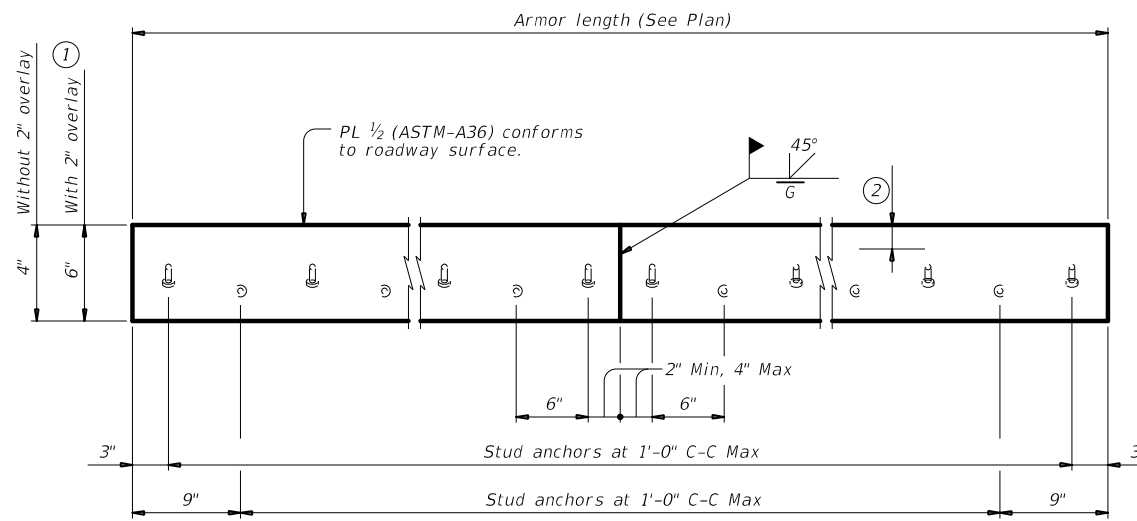
<sup>(12)</sup> Quantities shown are for one abutment only (with approach slab). With no approach slab, add 1.0 CY Class "C" concrete and 154 lbs reinforcing steel for 4 additional Bars H.

		<b>Bridge Division Standard</b>	
<b>ABUTMENTS</b> <b>TYPE TX28 THRU TX54</b> <b>PRESTR CONC I-GIRDERS</b> <b>24' ROADWAY</b>			
<b>AIG-24</b>			
FILE: IG-AIG2400-17.dgn	DN: TAR	CK: KCM	DW: JTR
©TxDOT	August 2017	CONTRACT NO. 0923 17	HIGHWAY CR 392
REVISIONS		JOB NO. 084	COUNTY COMANCHE
DIST. BWD	COUNTY	COUNTY	SHEET NO. 45

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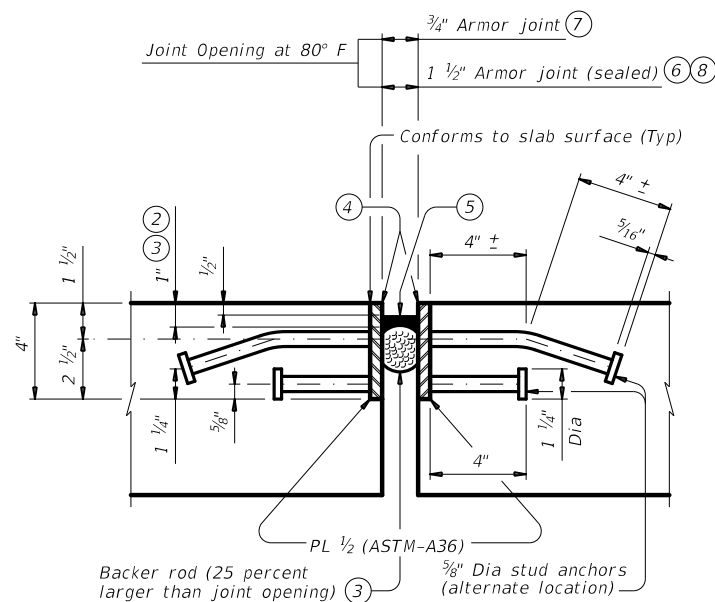


**PLANS OF ARMOR PLATES**

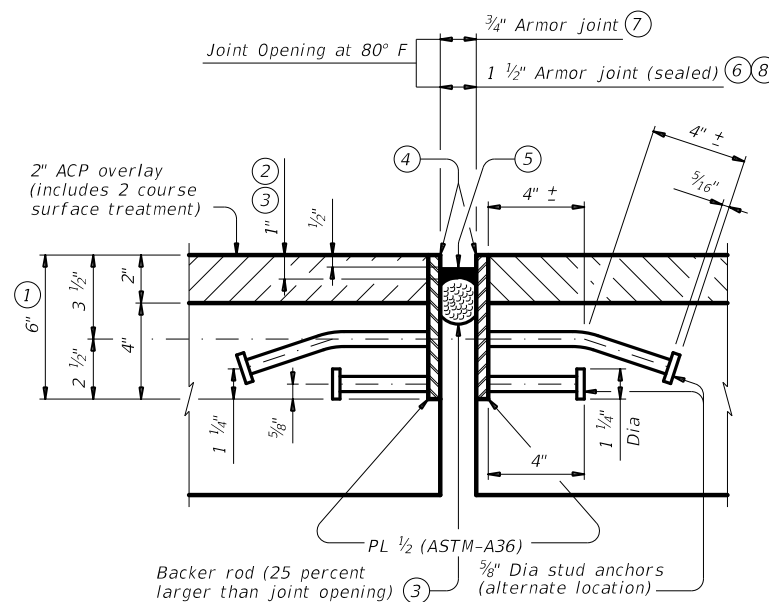


**ELEVATION OF BASIC ARMOR PLATE**

- ① Adjust 6" plate height for overlay thicknesses other than the 2" shown. Adjust weight by 1.70 plf for each 1/2" variation in thickness.
- ② Do not paint top 1 1/2" of plate if using sealed armor joint.
- ③ Set top of backer rod 1" below top of armor plate. Backer rod must be compatible with joint sealant. Use of multiple pieces to create a backer rod cross section is not permitted. Top of backer rod must be convex as shown.
- ④ Blast clean entire contact area between sealant and plate (SSPC-SP10) before installing sealant. Light brush blast and thoroughly clean all dust and debris from concrete surfaces in contact with joint sealant before application of silicone seal.
- ⑤ Use Class 7 joint sealant that conforms to DMS-6310.
- ⑥ Place sealant while ambient temperature is between 55°F and 80°F and is rising.
- ⑦ Armor joint does not include joint sealant or backer rod.
- ⑧ Armor joint (sealed) includes Class 7 joint sealant and backer rod.
- ⑨ Form vertical leg of seal as per the Manufacturer's recommendations. Use Class 4 joint sealant if Class 7 cannot be installed correctly. Install according to Manufacturer's recommendations.
- ⑩ Unless shown otherwise, terminate armor plate at slab break point if break is more than 2'-0" from slab edge.
- ⑪ See "Plans of Armor Plates".
- ⑫ At Fabricator's option, armor plate may extend up to 6" beyond this point for skews through 15°.
- ⑬ Align shipping angle perpendicular to joint.



SHOWN WITHOUT 2" OVERLAY AT JOINT LOCATION



SHOWN WITH 2" OVERLAY AT JOINT LOCATION ①

**ARMOR JOINT SECTIONS**

Showing Armor Joint (Sealed)

**FABRICATION NOTES:**

Match mark corresponding plate sections and secure together for shipment with shipping angle. Do not use erection bolts. Ship armor joints in convenient lengths of 10'-0" Min and 24'-0" Max unless necessary for stage construction or widenings. One shop splice is permitted in each shipping length provided no piece is less than 2'-0" long and sufficient studs are added to limit the stud to shop splice distance to 2" Min and 4" Max. Weld studs in accordance with AWS D1.1. Use groove welds for all shop and field butt splices. Grind smooth areas in contact with seal. Make all necessary field splice joint preparations in the shop. Paint the entire steel section, except as stated in Note 2, with System II or IV primer in accordance with Item 446 "Field Cleaning and Painting Steel." Provide paints in accordance with Item 446.2. Prepare steel and apply paint in accordance with Items 446.4.7.3 and 446.4.7.4. Shop drawings for the fabrication of armor joints will not require the Engineer's approval if fabrication is in accordance with the details shown on this standard.

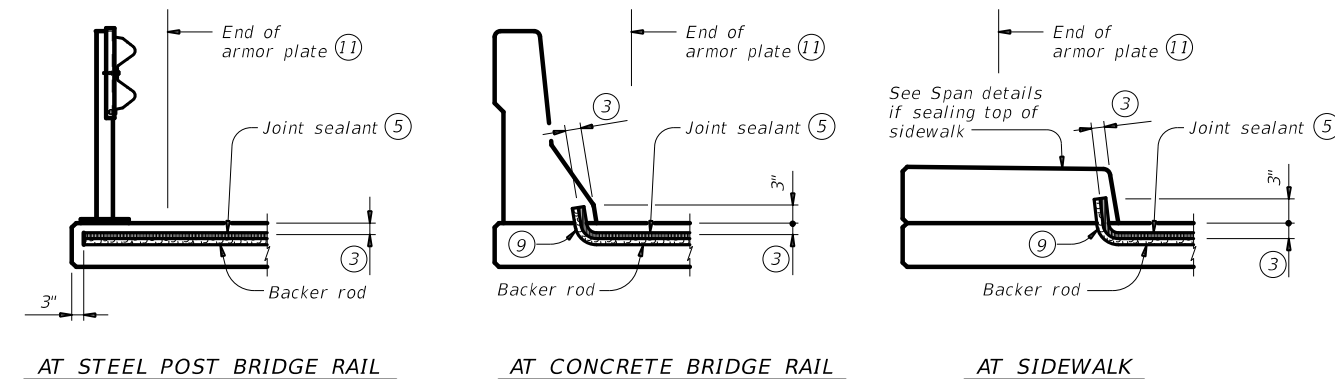
**CONSTRUCTION NOTES:**

Secure armor joints in position and place to proper grade and alignment by welding braces to adjacent reinforcing steel, to prestressed beam stirrups, or to anchors cast in concrete diaphragms. Include cost of temporary bracing in the price bid for Armor Joint. Remove shipping angle immediately after each joint half is secured in place. Grind smooth, and touch up with organic zinc-rich paint.

**GENERAL NOTES:**

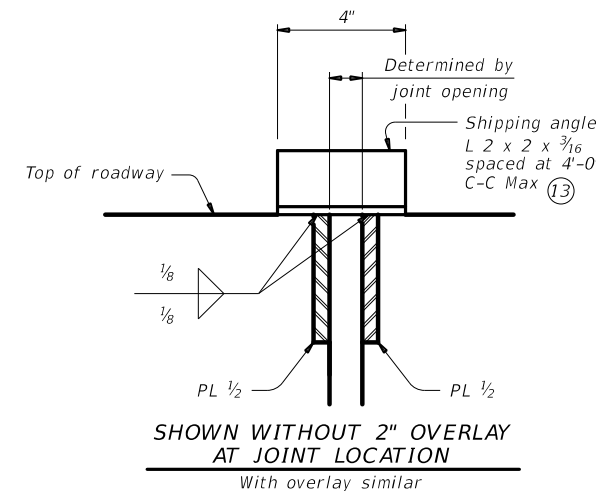
Provide armor joints at locations shown on the plans. Provide the seal when "Armor Joint (Sealed)" is noted on the plans. These joint details accommodate a joint movement range of 1 3/8" (3/4" opening movement and 5/8" closure movement). Payment for armor joint, with or without seal, is based on length of armor plate.

WEIGHTS FOR ONE ARMOR JOINT (2 PLATES)	
WITHOUT OVERLAY	16.10 plf
WITH 2" OVERLAY ①	22.90 plf



**JOINT SEALANT TERMINATION DETAILS**

Armor joint (sealed) only. Armor plate is not shown for clarity.



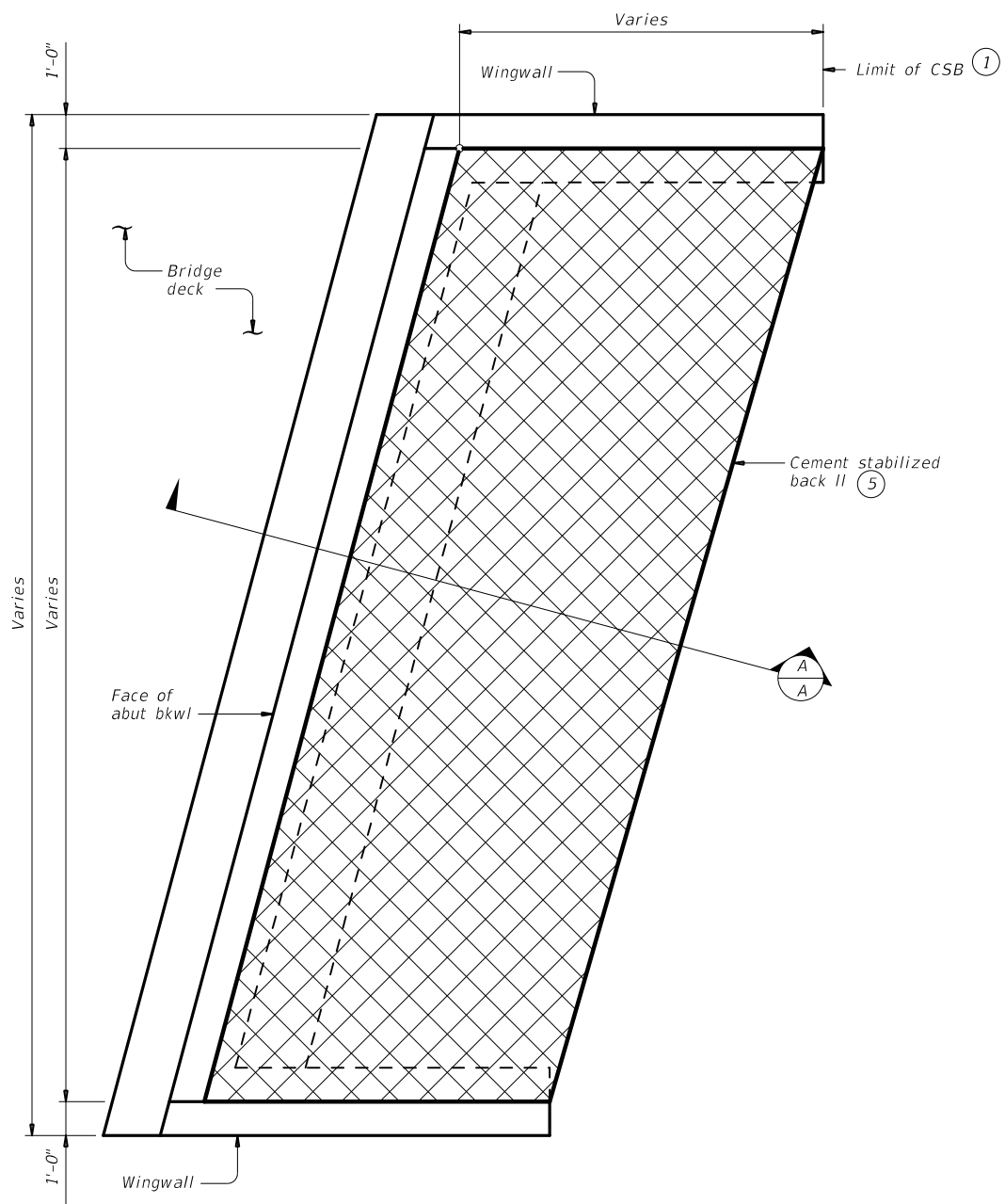
**SHIPPING ANGLE**

An alternate method of securing joint sections may be used if approved by the Bridge Division. Erection bolts are not allowed.

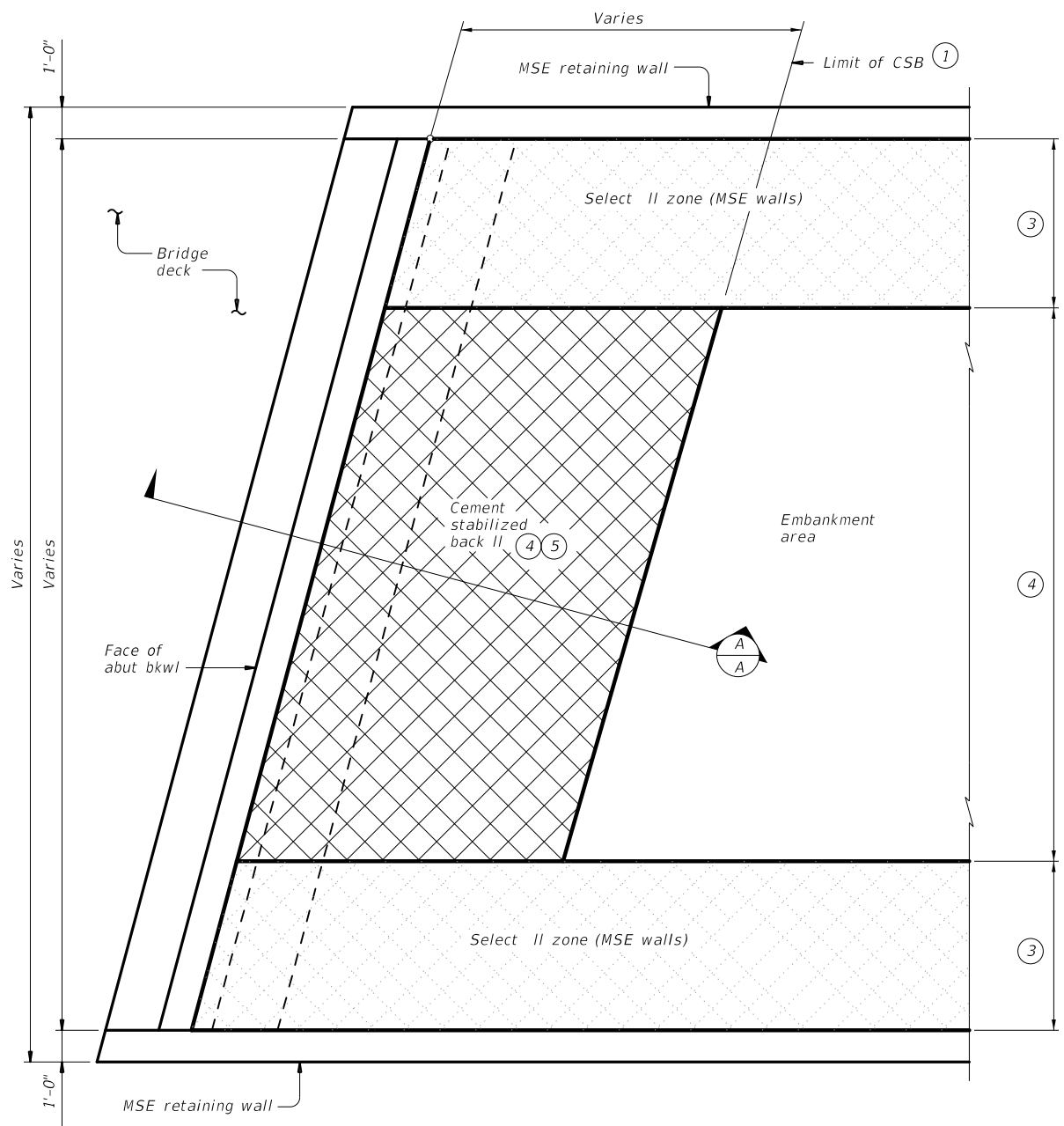
				<b>Bridge Division Standard</b>	
<h2>ARMOR JOINT DETAILS</h2>					
<h3>AJ</h3>					
FILE:	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT	
©TxDOT	April 2019	CONTRACT	SECTION	JOB	HIGHWAY
	REVISIONS	0923	17	084	CR 392
		DIST	COUNTY	SHEET NO.	
		BWD	COMANCHE	46	

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DATE: 12/19/2023 4:00:53 PM  
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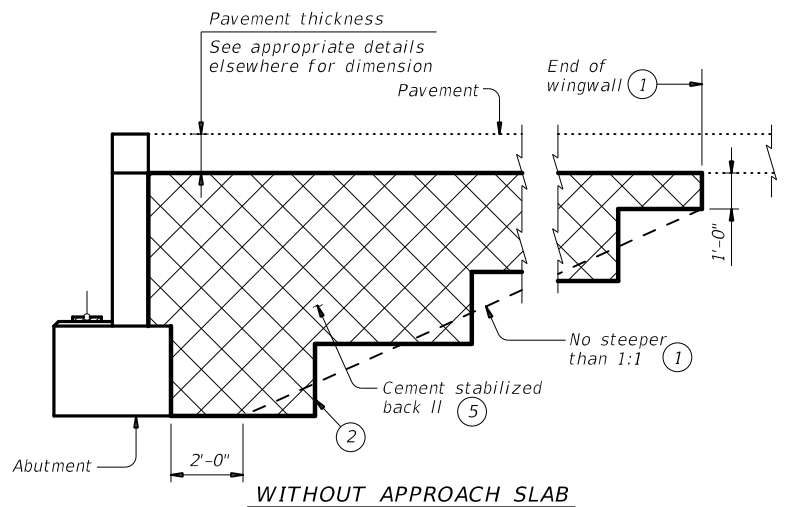
**OPTION 1 ~ PLAN WITH WINGWALLS**  
 Cast-in-place retaining walls similar.



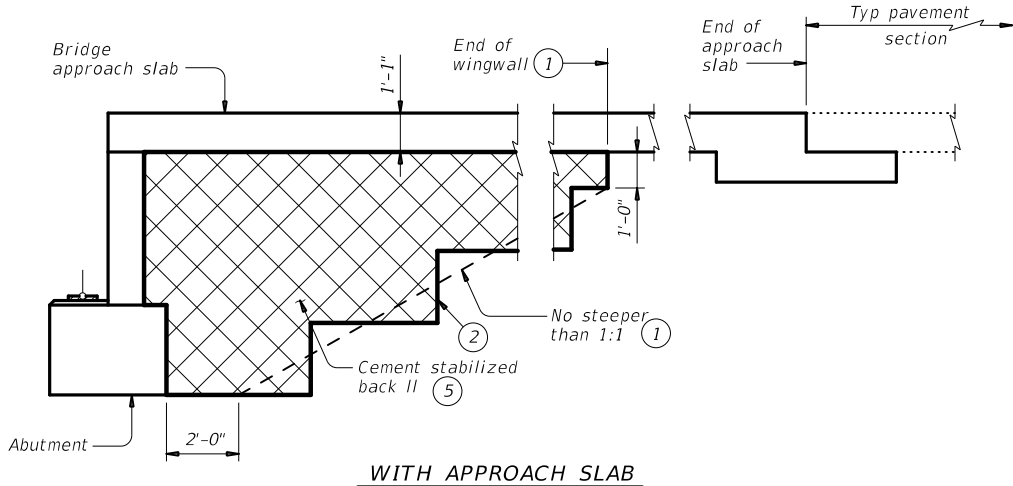
**OPTION 1 ~ PLAN WITH MSE RETAINING WALLS**

- ① Usual limit of Cement Stabilized Back II is at end of wingwall. Extend CSB limits as required to maintain a slope no steeper than 1:1 at bottom of back II.
- ② Bench back II as shown with 12" (approximate) bench depths.
- ③ Where MSE retaining walls are present, adjust CSB limits to accommodate the select II zone. See retaining wall details for additional information.
- ④ When distance between select II zones is less than 5'-0", MSE select II may be substituted for cement stabilized back II with approval from the Engineer.
- ⑤ If shown in the plans, owable back II can be used as a substitute for cement stabilized back II with the following constraints:
  - a) If owable back II is to be placed over MSE back II, then a filter fabric will be placed over the MSE back II prior to placement of the owable II; and
  - b) Place owable II in lifts not exceeding 2 feet in height. Place each successive lift when the previous lift has stiffened/hardened (i.e. has lost its owability).

**GENERAL NOTES:**  
 See the Bridge Layout for selected Option. Option 1 is intended for construction only requiring plasticity index (PI) controlled embankment II or excavation in competent soils/rocks in order to construct the abutment. Option 2 is intended for new construction requiring high plasticity embankment II with a PI greater than 30 or pavement built in poor native soil. Poor soils are defined as high plasticity clays or expansive clays.  
 Construct abutment back II in accordance with Item 400, "Excavation and Back II for Structures".  
 Provide Cement Stabilized Back II (CSB) meeting the requirements of Item 400, "Excavation and Back II for Structures", to the limits shown at bridge abutments.  
 If required elsewhere in the plans, provide Flowable Back II meeting the requirements of Item 401, "Flowable Back II", to the limits shown at bridge abutments.  
 Details are drawn showing left forward skew. See Bridge Layout for actual skew direction.  
 These details do not apply when Concrete Block retaining walls are used in lieu of wingwalls.



**WITHOUT APPROACH SLAB**



**WITH APPROACH SLAB**  
 (Showing BAS-C, BAS-A similar.)

**SECTION A-A**



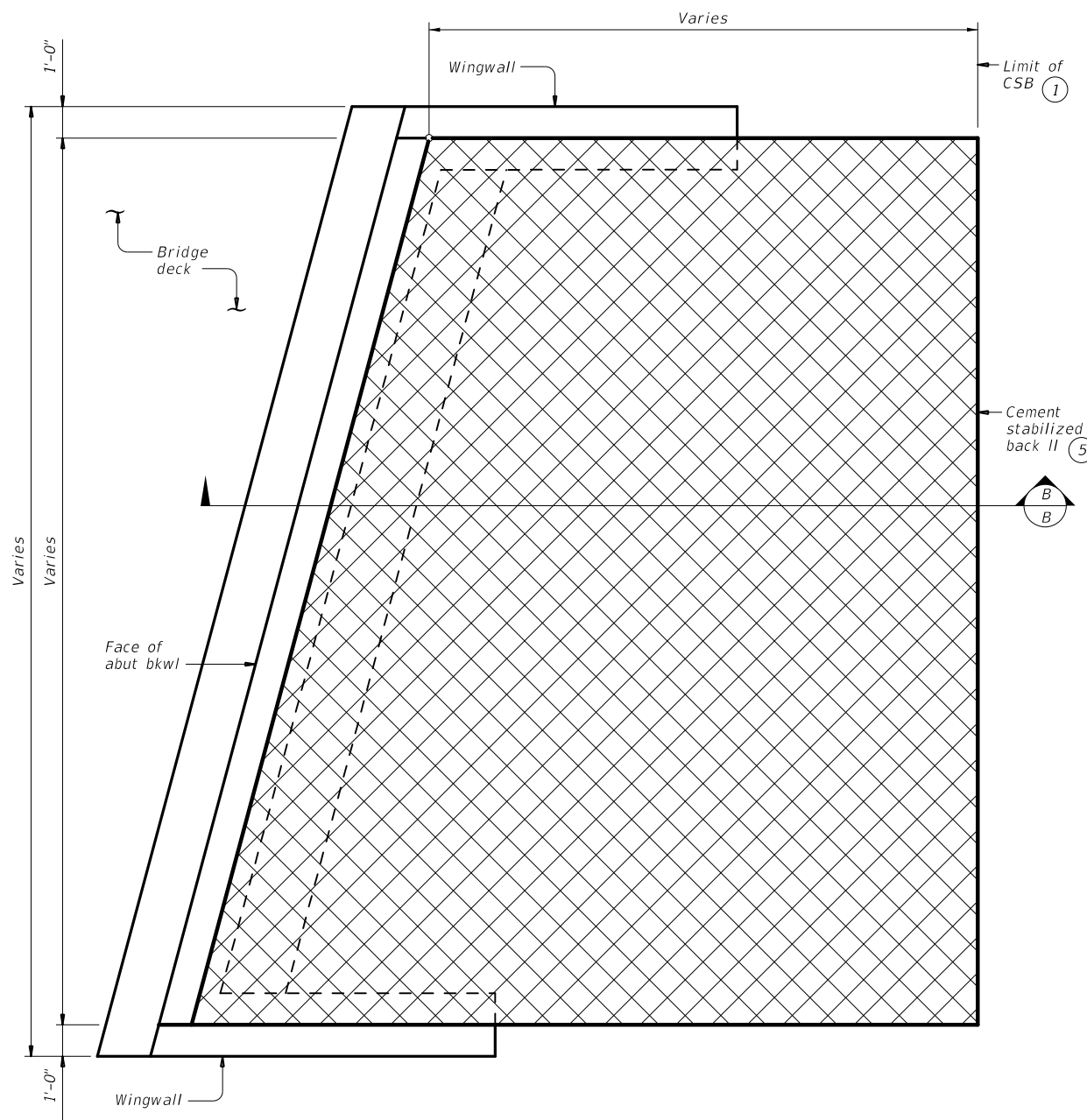
**CEMENT STABILIZED ABUTMENT BACKFILL BRIDGE ABUTMENT**

**CSAB**

FILE: MS-CSAB-23.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT	April 2019	CONT	SECT	JOB
	REVISIONS	0923	17	084
02-20: Added Option 2.		DIST	COUNTY	SHEET NO.
03-23: Updated General Notes.		BWD	COMANCHE	47

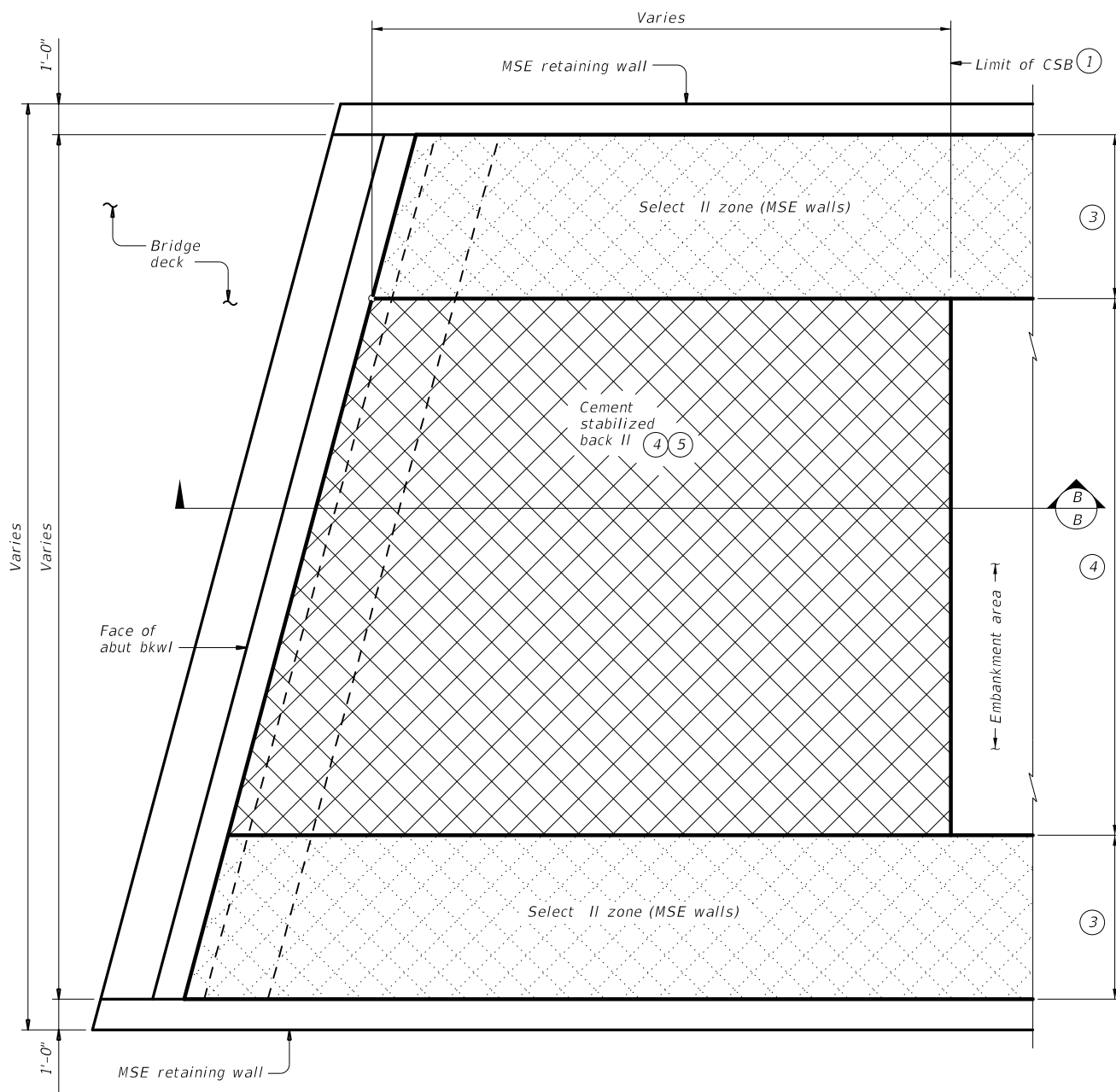
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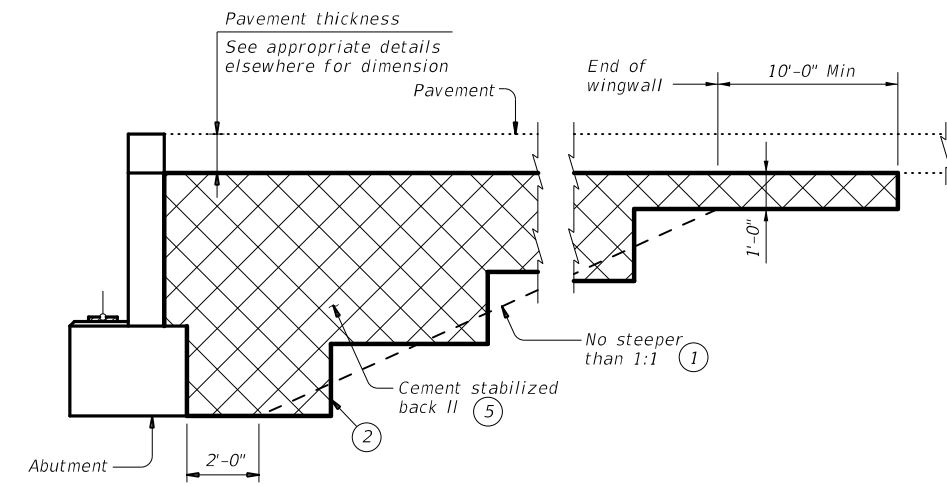
**OPTION 2 ~ PLAN WITH WINGWALLS**

Cast-in-place retaining walls similar.

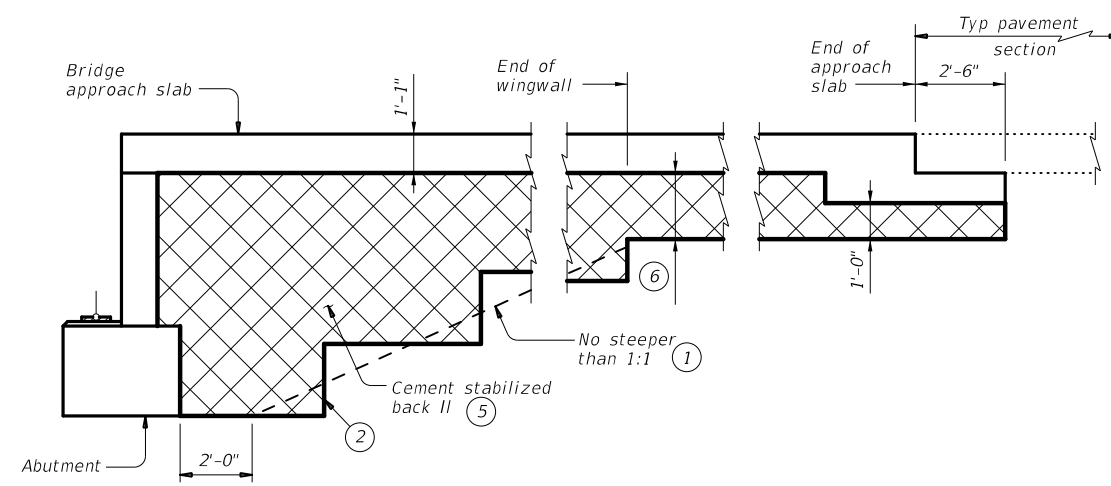


**OPTION 2 ~ PLAN WITH MSE RETAINING WALLS**

- ① Usual limit of Cement Stabilized Back II is at end of wingwall. Extend CSB limits as required to maintain a slope no steeper than 1:1 at bottom of back II.
- ② Bench back II as shown with 12" (approximate) bench depths.
- ③ Where MSE retaining walls are present, adjust CSB limits to accommodate the select II zone. See retaining wall details for additional information.
- ④ When distance between select II zones is less than 5'-0", MSE select II may be substituted for cement stabilized back II with approval from the Engineer.
- ⑤ If shown in the plans, owable back II can be used as a substitute for cement stabilized back II with the following constraints:
  - a). If owable back II is to be placed over MSE back II, then a filter fabric will be placed over the MSE back II prior to placement of the owable II; and
  - b). Place owable II in lifts not exceeding 2 feet in height. Place each successive lift when the previous lift has stiffened/hardened (i.e. has lost its owability).
- ⑥ 1'-0" for BAS-A  
1'-10" for BAS-C



**WITHOUT APPROACH SLAB**



**SECTION B-B**

**WITH APPROACH SLAB**  
(Showing BAS-C, BAS-A similar.)

SHEET 2 OF 2



**CEMENT STABILIZED  
 ABUTMENT BACKFILL  
 BRIDGE ABUTMENT**

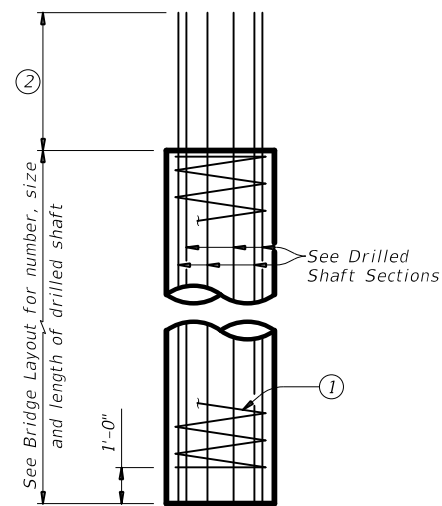
**CSAB**

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©TxDOT	April 2019	CONTRACT	SECTION	JOB
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02-20: Added Option 2.		DIST	COUNTY	SHEET NO.
03-23: Updated General Notes.		BWD	COMANCHE	48

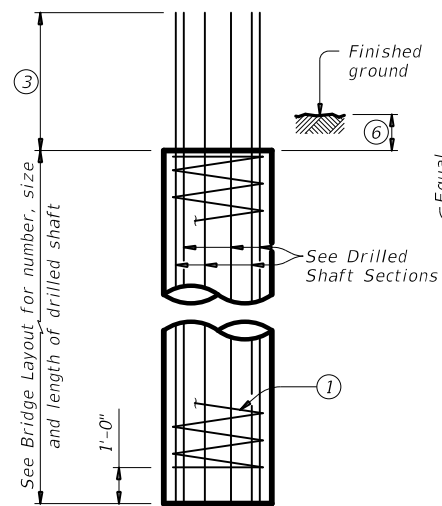


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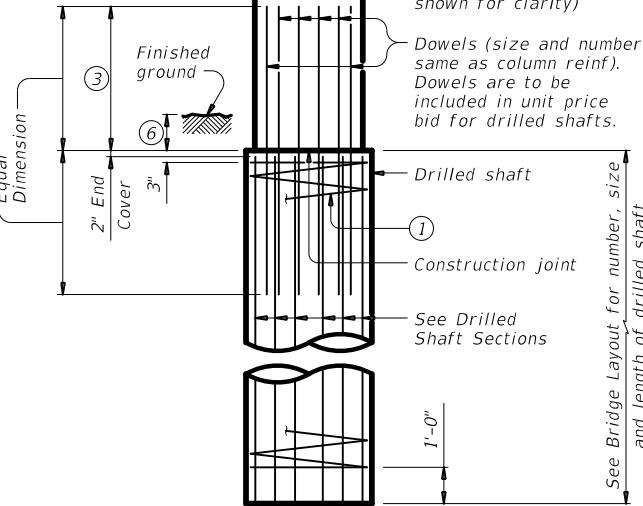
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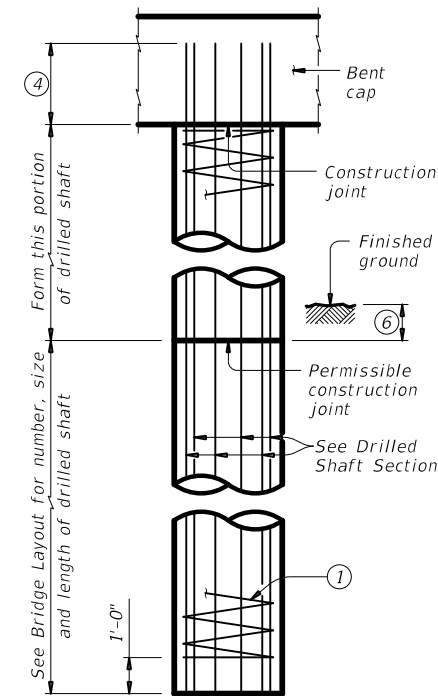
ABUTMENTS, WINGWALLS AND MULTI-DRILLED SHAFT FOOTINGS



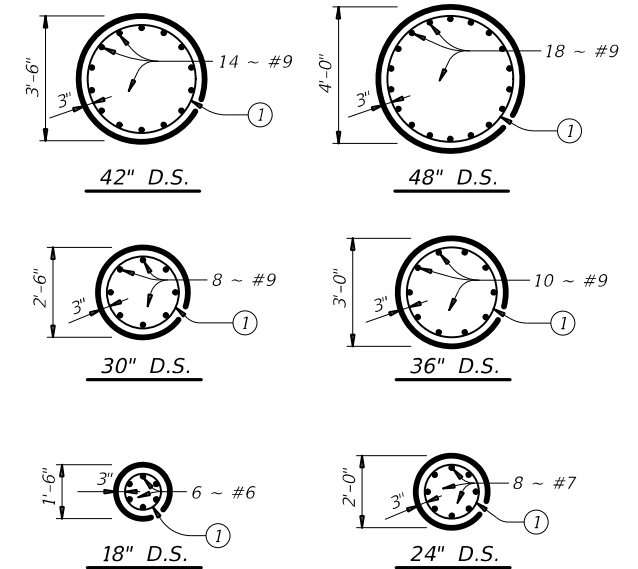
INTERIOR BENTS DRILLED SHAFT DIA EQUAL TO COLUMN DIA



INTERIOR BENTS DRILLED SHAFT DIA GREATER THAN COLUMN DIA



OPTIONAL INTERIOR BENT DRILLED SHAFT DETAIL ⑤

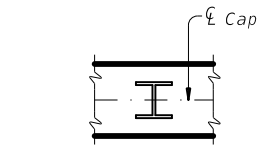


DRILLED SHAFT SECTIONS

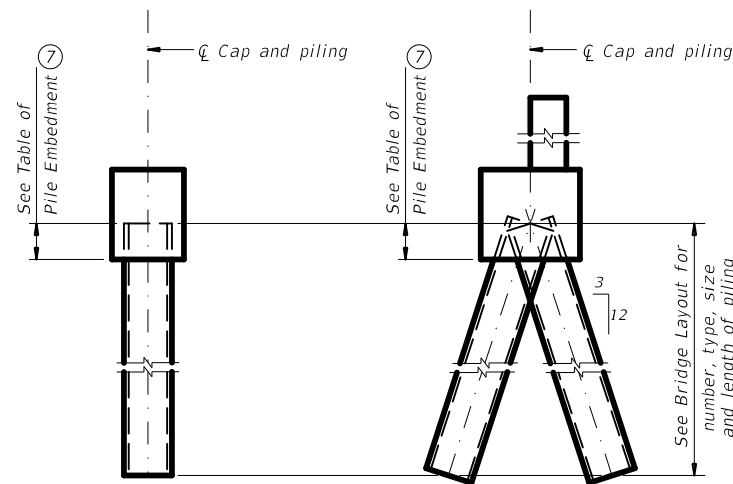
**DRILLED SHAFT DETAILS**

TABLE OF PILE EMBEDMENT	
Pile Type	Embedment Depth (Ft)
16" Sq Concrete 18" Sq Concrete HP14 Steel HP16 Steel	1'-0"
20" Sq Concrete 24" Sq Concrete HP18 Steel	1'-6"

See Prestressed Concrete Piling (CP) standard for additional details on concrete pile embedment.



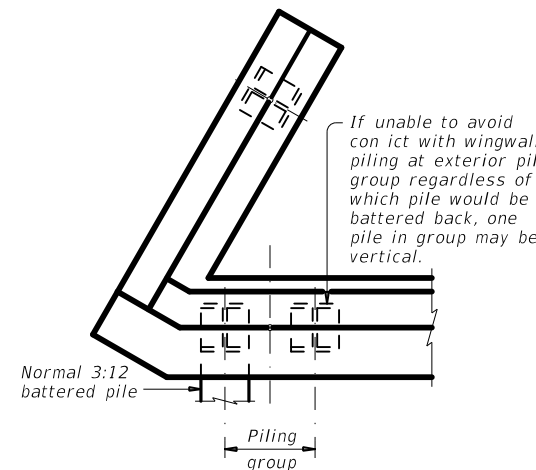
ORIENTATION OF STEEL H-PILING



VERTICAL PILE

BATTERED PILE

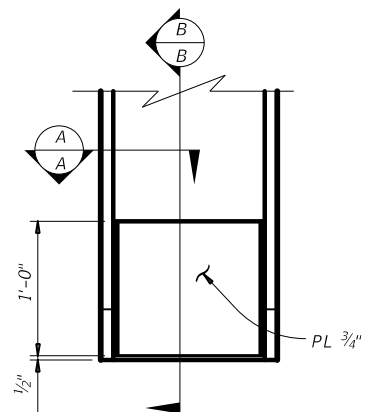
PILING DETAILS  
(Concrete or steel H)



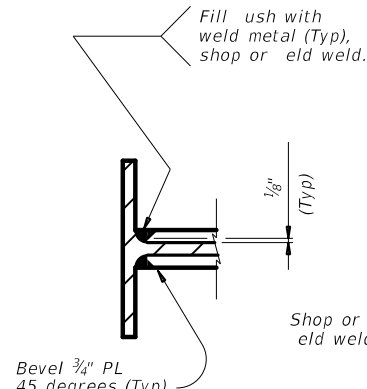
DETAIL "A"

(Showing plan view of a 30° skewed abutment)

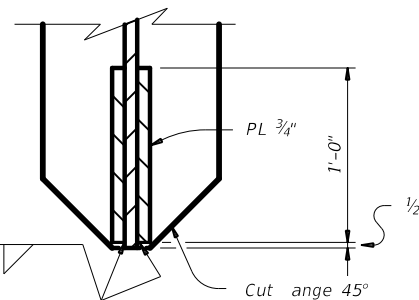
- ① #3 spiral at 6" pitch (one and a half at turns top and bottom).
- ② Min extension into supported element:  
#6 Bars = 1'-11"  
#7 Bars = 2'-0"  
#9 Bars = 2'-3"
- ③ Min lap with column reinf:  
#7 Bars = 2'-11"  
#9 Bars = 3'-9"  
#11 Bars = 4'-8"
- ④ Min extension into supported element:  
#6 Bars = 1'-11"  
#7 Bars = 2'-3"  
#9 Bars = 2'-9"
- ⑤ Drilled shafts may extend to the bottom of bent caps for "H" heights of 6 ft and less (as shown on the Bridge Layout), if approved. This option can only be used when the drilled shaft diameter equals the column diameter. Obtain approval of the forming method above the ground line prior to construction. No adjustments in payment will be made if this option is used.
- ⑥ 1'-0" Min, unless shown otherwise on plans.
- ⑦ Or as shown on plans.



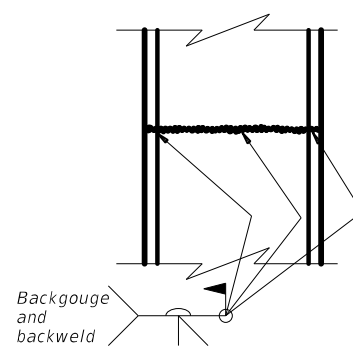
ELEVATION



SECTION A-A

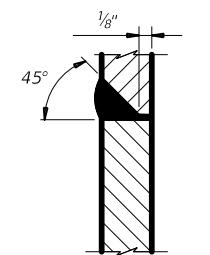


SECTION B-B



STEEL H-PILE SPLICE DETAIL

Use when required.



SECTION THRU FLANGE OR WEB

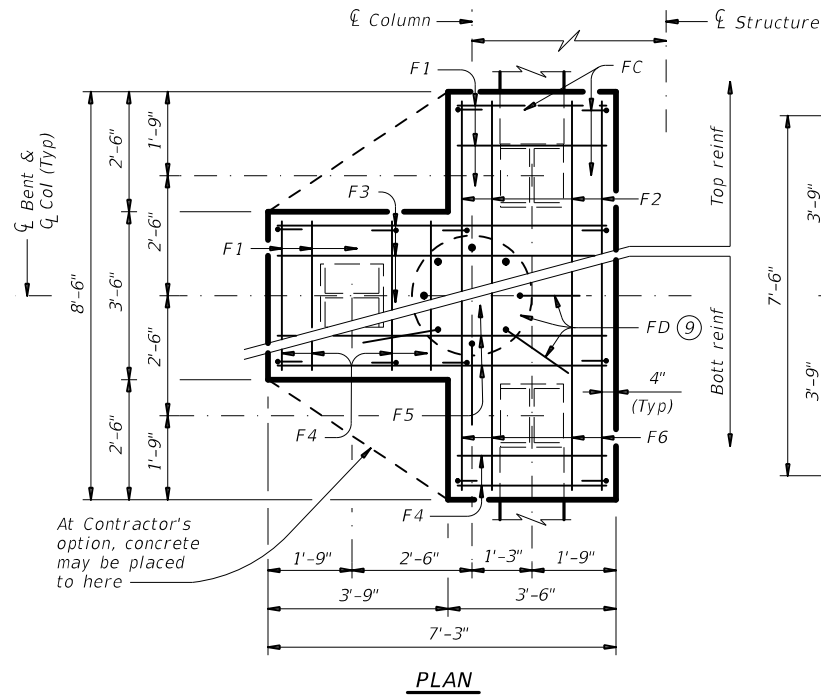
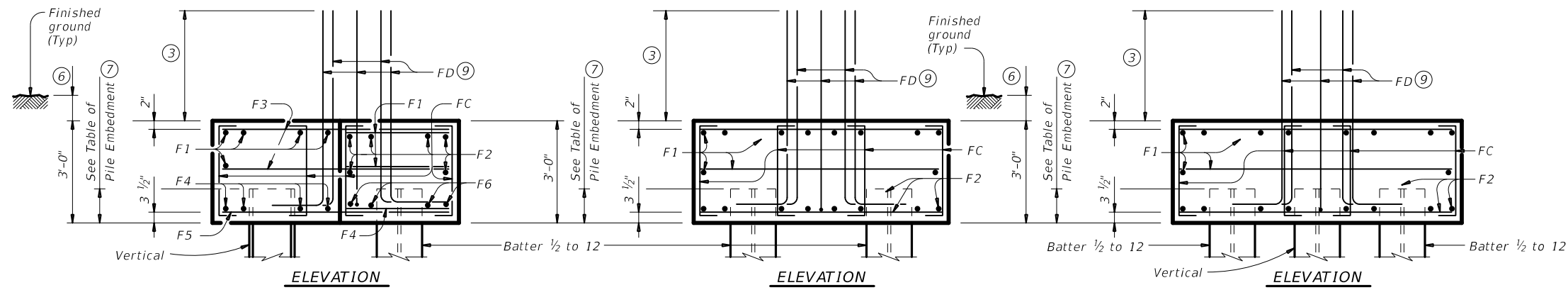
**STEEL H-PILE TIP REINFORCEMENT**

See Item 407 "Steel Piling" to determine when tip reinforcement is required and for options to the details shown.

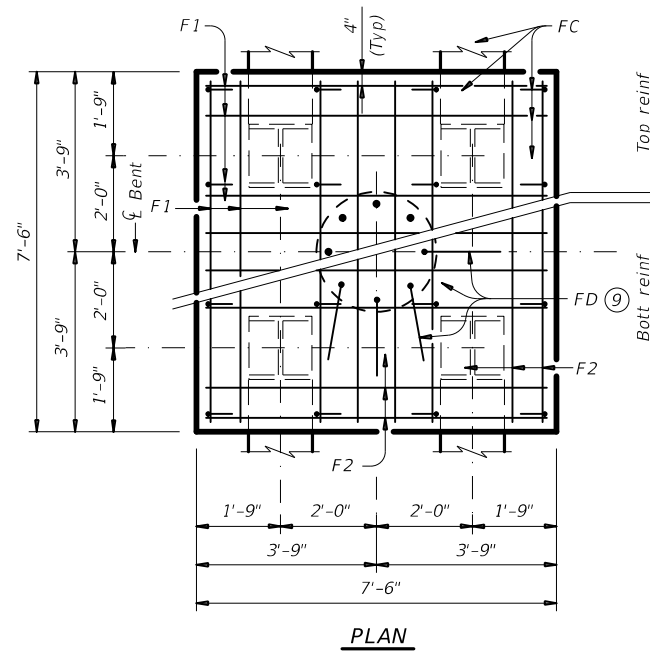
SHEET 1 OF 2

		<b>Bridge Division Standard</b>	
<b>COMMON FOUNDATION DETAILS</b>			
<b>FD</b>			
FILE: MS-FD-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
©TxDOT April 2019	CONF	SECT	JOB
REVISIONS	0923	17	084
01-20: Added #11 bars to the FD bars.	DIST	COUNTY	SHEET NO.
	BWD	COMANCHE	49

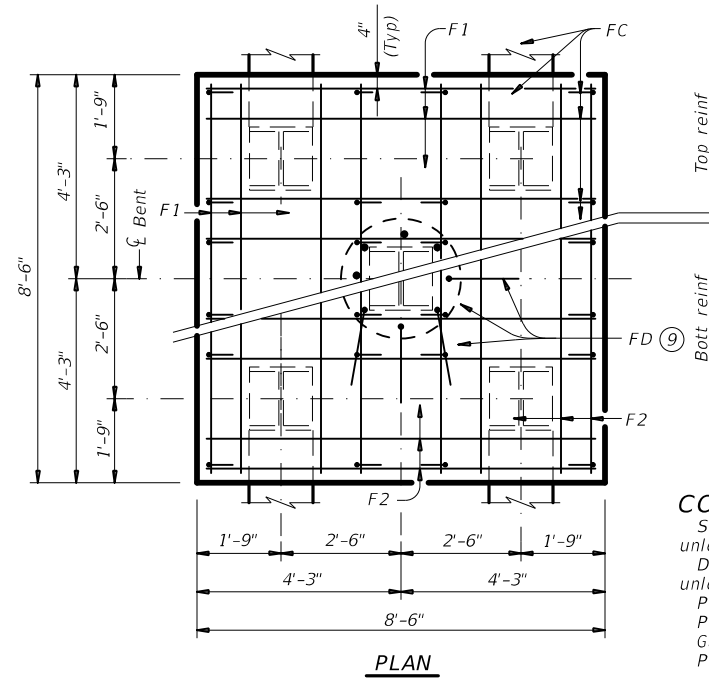
12/19/2023 4:00:55 PM  
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 FILE: R:\1005000-1005999\1005472.03\04\_DOCUMENTS\DESIGN\Plan\_Set\7. Bridge\_Standards\I\_GIRDER\_STANDARDS\MS-FD-20.dgn



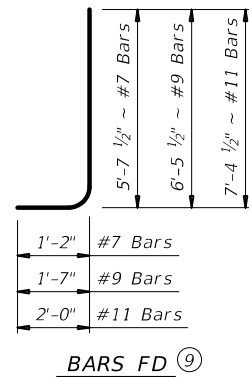
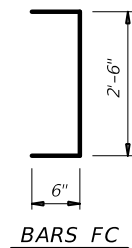
**THREE PILE FOOTING<sup>⑧</sup>**  
 For 36" Dia and smaller columns.



**FOUR PILE FOOTING<sup>⑧</sup>**  
 For 42" Dia and smaller columns.



**FIVE PILE FOOTING<sup>⑧</sup>**  
 For 42" Dia and smaller columns.



- ③ Min lap with column reinforcing:  
 #7 Bars = 2'-11"  
 #9 Bars = 3'-9"  
 #11 Bars = 4'-8"
- ⑥ 1'-0" Min, unless shown otherwise on plans.
- ⑦ Or as shown on plans.
- ⑧ See Bridge Layout for type, size and length of piling.
- ⑨ Number and size of FD bars must match column reinforcing. Tie FD bars to the top of the bottom reinforcing mat.
- ⑩ Adjust FD quantity, size and weight as needed to match column reinforcing.

**TABLE OF FOOTING QUANTITIES FOR 30" COLUMNS**

ONE 3 PILE FOOTING					
Bar	No.	Size	Length	Weight	
F1	11	#4	3'- 2"	23	
F2	6	#4	8'- 2"	33	
F3	6	#4	6'- 11"	28	
F4	8	#9	3'- 2"	86	
F5	4	#9	6'- 11"	94	
F6	4	#9	8'- 2"	111	
FC	12	#4	3'- 6"	28	
FD <sup>⑩</sup>	8	#9	8'- 1"	220	
Reinforcing Steel				Lb	623
Class "C" Concrete				CY	4.8

ONE 4 PILE FOOTING					
Bar	No.	Size	Length	Weight	
F1	20	#4	7'- 2"	96	
F2	16	#8	7'- 2"	306	
FC	16	#4	3'- 6"	37	
FD <sup>⑩</sup>	8	#9	8'- 1"	220	
Reinforcing Steel				Lb	659
Class "C" Concrete				CY	6.3

ONE 5 PILE FOOTING					
Bar	No.	Size	Length	Weight	
F1	20	#4	8'- 2"	109	
F2	16	#9	8'- 2"	444	
FC	24	#4	3'- 6"	56	
FD <sup>⑩</sup>	8	#9	8'- 1"	220	
Reinforcing Steel				Lb	829
Class "C" Concrete				CY	8.0

**CONSTRUCTION NOTES:**

See Bridge Layout for foundation type required. Use these foundation details unless shown otherwise.  
 Drive piling under abutment wingwalls to a minimum resistance of 10 Tons/Pile unless shown otherwise.  
 Provide Class C Concrete ( $f'_c = 3,600$  psi), unless shown otherwise.  
 Provide Grade 60 reinforcing steel.  
 Galvanize reinforcing if shown elsewhere in the plans.  
 Provide bar laps for drilled shaft reinforcing, where required, as follows:  
 Uncoated or galvanized (#6) ~ 2'-6"  
 Uncoated or galvanized (#7) ~ 2'-11"  
 Uncoated or galvanized (#9) ~ 3'-9"

**GENERAL NOTES:**

Designed according to AASHTO LRFD Bridge Design Specifications.

Cover dimensions are clear dimensions, unless noted otherwise.  
 Reinforcing bar dimensions shown are out-to-out of bar.

**DESIGNER NOTES:**

Do not use the drilled shaft details shown on this standard for retaining wall, noise wall, barrier, or sign foundations without structural evaluation.  
 Do not use the footings shown on this standard in direct contact with salt water or exposed to salt water spray.  
 Maximum allowable pile loads for the footings shown are:  
 72 Tons/Pile with 24" Dia Columns  
 80 Tons/Pile with 30" Dia Columns  
 100 Tons/Pile with 36" Dia Columns  
 120 Tons/Pile with 42" Dia Columns

SHEET 2 OF 2

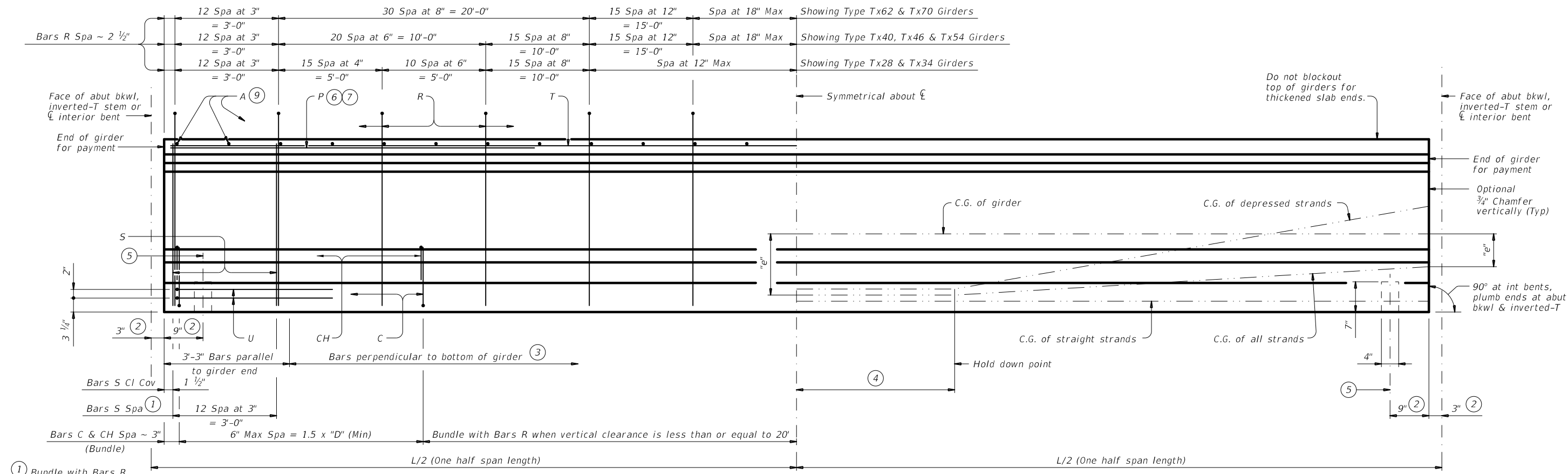


**COMMON FOUNDATION DETAILS**

**FD**

FILE: MS-FD-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0923	17	084	CR 392
01-20: Added #11 bars to the FD bars.	DIST	COUNTY	SHEET NO.	
	BWD	COMANCHE	50	

12/19/2023 4:00:55 PM  
 DATE: R: 1005000-1005999-1005472-03\04\_DOCUMENTS\DESIGN\IP Ion\_Set\7. Bridge Standards\I-GIRDER-STANDARDS\IG-160-23.dgn  
 FILE:



- ① Bundle with Bars R.
- ② Measured along  $\epsilon$  Girder at interior bents; perpendicular to abutment bkwl or inverted-T stem.
- ③ The average of the top and bottom spacing of Bars R cannot exceed the required spacing.
- ④ L/20, but not less than 5'-0" (-0,+2).

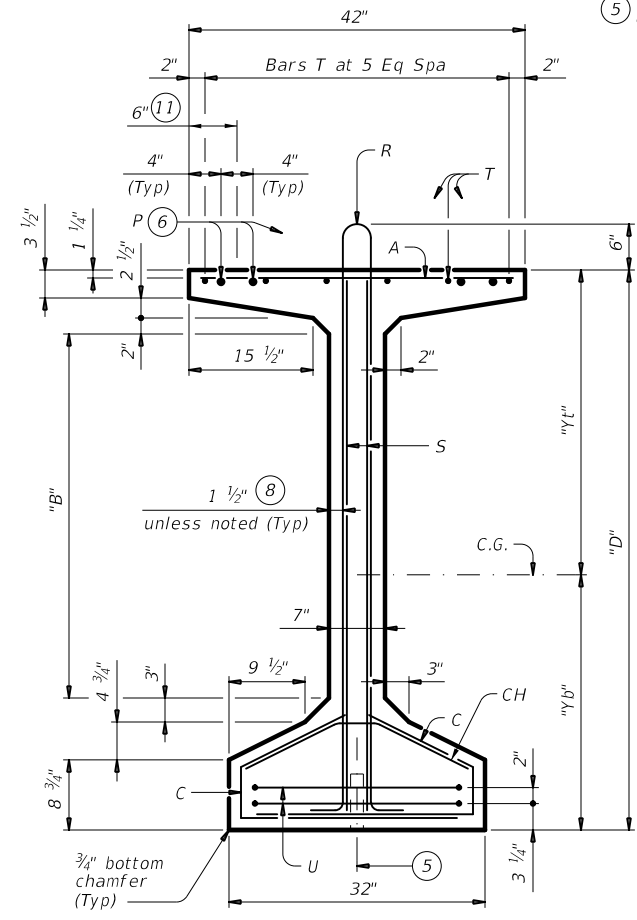
**GIRDER ELEVATION**

- ⑥ Bars P (#6 x 15'-0") required in Tx62 and Tx70 girders. At the fabricator's option bars larger than #6 may be used. When L is less than 50 ft, Bars P are to be the same length as Bars T.
- ⑦ Bars P (#6 x 15'-0") are only required in Tx28, Tx34, Tx40, Tx46, and Tx54 girders when "e" at girder ends exceeds 0.25 x "D". At the fabricator's option bars larger than #6 may be used. When L is less than 50 ft, Bars P are to be the same length as Bars T.
- ⑧ 1 3/8" Clear Cover to Bars S.
- ⑨ Space Bars A at 6" Max for girders requiring overhang bracket hangers. Space at 12" Max for all other girders. Tie to Bars R as necessary. See standard IGMS for "Deck Forming Notes".
- ⑩ Based on 155 pcf total weight of concrete and reinforcing steel.
- ⑪ Smooth trowel nish on the slab overhang side of exterior girder.

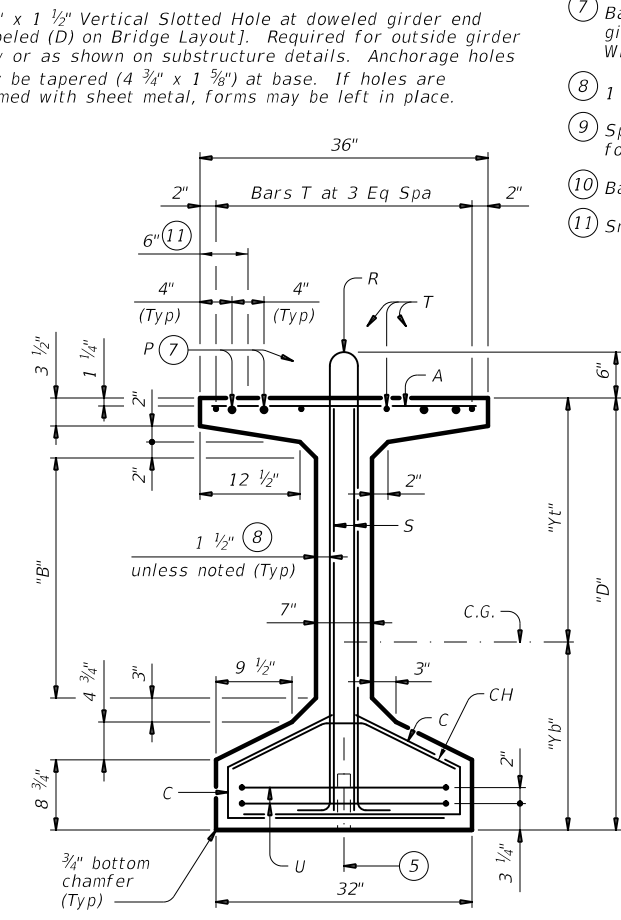
GIRDER DIMENSIONS AND SECTION PROPERTIES								
Girder Type	"D" (in.)	"B" (in.)	"Yt" (in.)	"Yb" (in.)	Area (in. <sup>2</sup> )	"Ix" (in. <sup>4</sup> )	"Iy" (in. <sup>4</sup> )	Weight (10) (plf)
Tx28	28	6	15.02	12.98	585	52,772	40,559	630
Tx34	34	12	18.49	15.51	627	88,355	40,731	675
Tx40	40	18	21.90	18.10	669	134,990	40,902	720
Tx46	46	22	25.90	20.10	761	198,089	46,478	819
Tx54	54	30	30.49	23.51	817	299,740	46,707	880
Tx62	62	37 1/2"	33.72	28.28	910	463,072	57,351	980
Tx70	70	45 1/2"	38.09	31.91	966	628,747	57,579	1,040

**GENERAL NOTES:**  
 Designed according to AASHTO LRFD Bridge Design Specifications.  
 Provide Class H concrete.  
 Provide Grade 60 reinforcing steel.  
 An equal area of deformed Welded Wire Reinforcement (WWR) (ASTM A1064) may be substituted for Bars A, C, R or T unless otherwise noted.  
 It is permissible for bars or strands to come in contact with materials used in forming anchor holes.  
 When vertical clearance of the span is less than or equal to 20', provide additional Bars C and CH in every girder of that span.

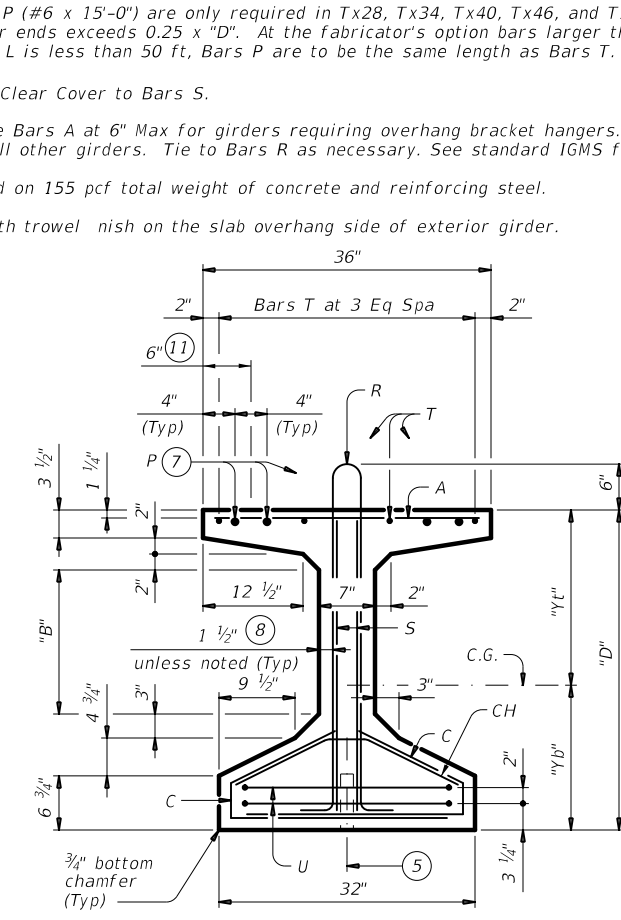
Cover dimensions are clear dimensions, unless noted otherwise.  
 Reinforcing bar dimensions shown are out-to-out of bar.



**TYPE Tx62 & Tx70**



**TYPE Tx46 & Tx54**



**TYPE Tx28, Tx34 & Tx40**

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation  
 Bridge Division Standard

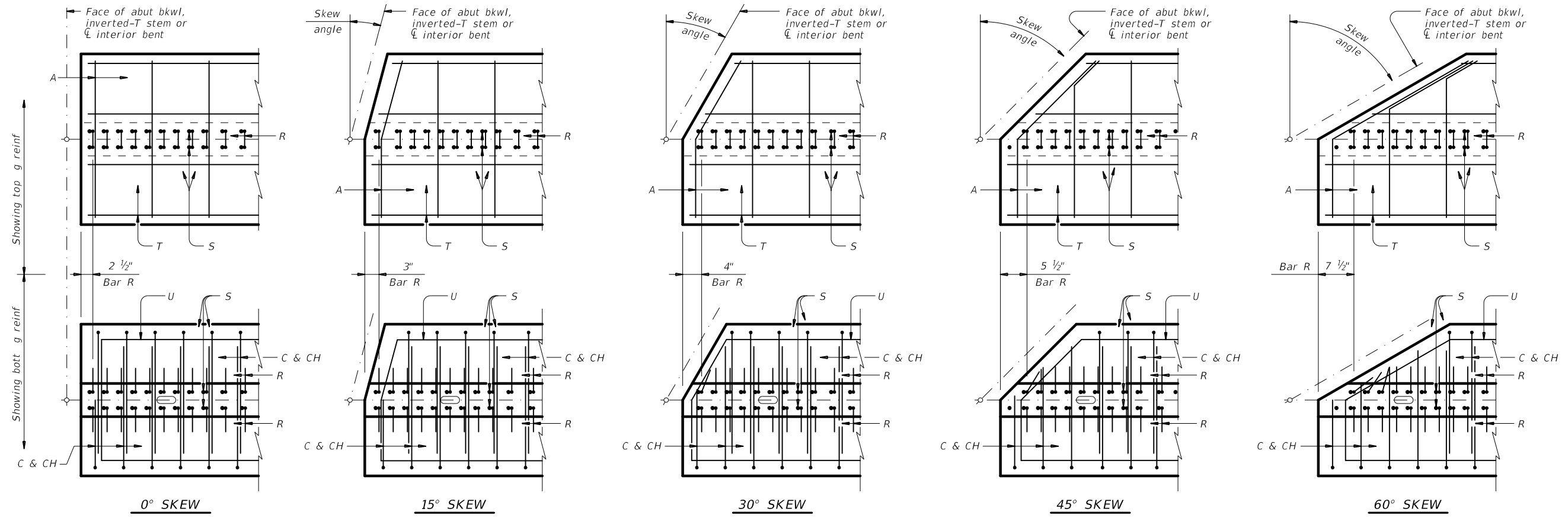
**PRESTRESSED CONCRETE I-GIRDER DETAILS**

IGD

FILE:	DN: TxDOT	CK: JMH	DW: JTR	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0923	17	084	CR 392
10-19: Added Bars C and CH full length for VC=20	DIST	COUNTY	SHEET NO.	
3-23: Clari ed C and CH requirement	BWD	COMANCHE	51	

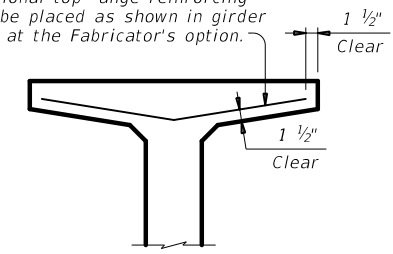
12/19/2023 4:00:56 PM  
 DATE: R: 1005000-1005999.1005472.03.04\_DOCUMENTS\DESIGN\Plan\_Series7. Bridge Standards I-GIRDER STANDARDS IG-16D-23.dgn  
 FILE:

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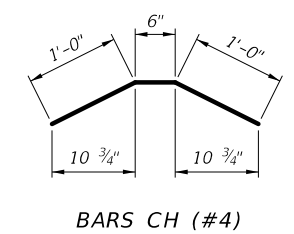


**PLAN OF GIRDER ENDS <sup>(12)</sup>**

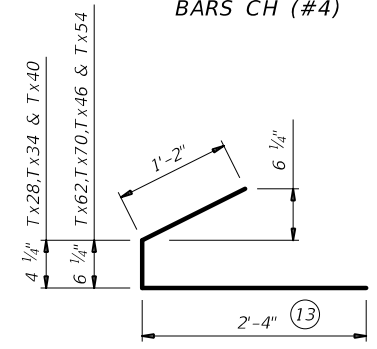
To control top angle cracking that may occur during form removal, additional top angle reinforcing may be placed as shown in girder ends at the Fabricator's option.



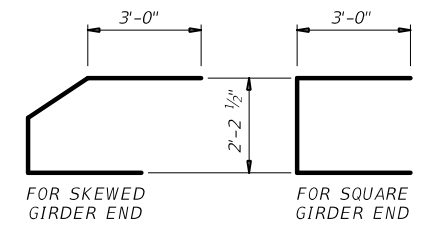
**OPTIONAL TOP FLANGE REINFORCING DETAIL**



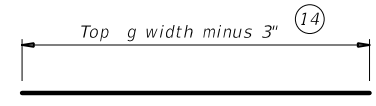
**BARS CH (#4)**



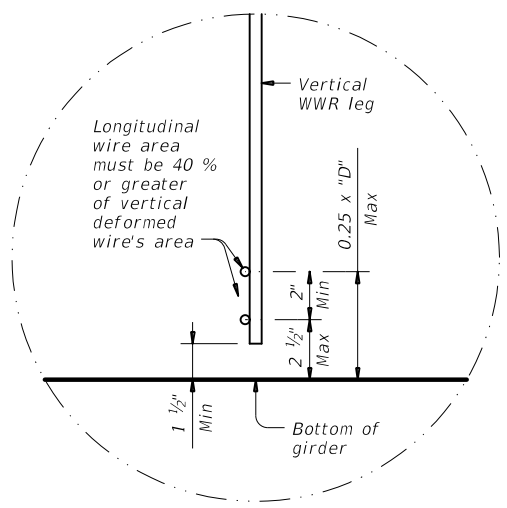
**BARS C (#4)**



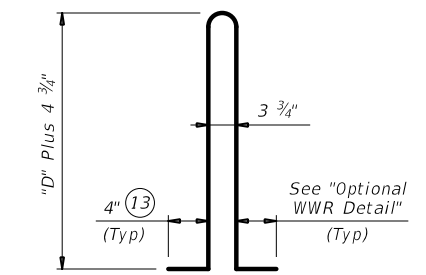
**BARS U (#5)**



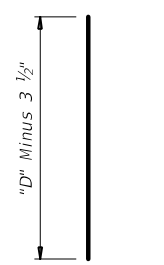
**BARS A (#3)**



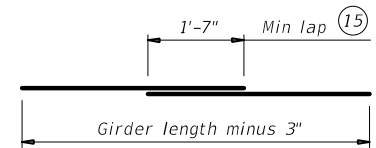
**OPTIONAL WELDED WIRE REINFORCEMENT (WWR) DETAIL**



**BARS R (#4) <sup>(16)</sup>**



**BARS S (#6)**



**BARS T (#4)**

- <sup>(12)</sup> Reinforcing patterns shown are provided as guides to determine reinforcement placement in skewed ends. Place Bars S as close to girder end as cover requirements permit, which may prevent them to be bundled with Bars R.
- <sup>(13)</sup> Bars may be cut or bent at skewed end as required.
- <sup>(14)</sup> Increase as necessary for bars at skewed end.
- <sup>(15)</sup> No portion of bar less than 10 ft.
- <sup>(16)</sup> For Welded Wire Reinforcement (WWR) option, area of Bars R may be reduced in proportion to the increase in reinforcement yield strength over 60 ksi. Yield strength of WWR is limited to 75 ksi.



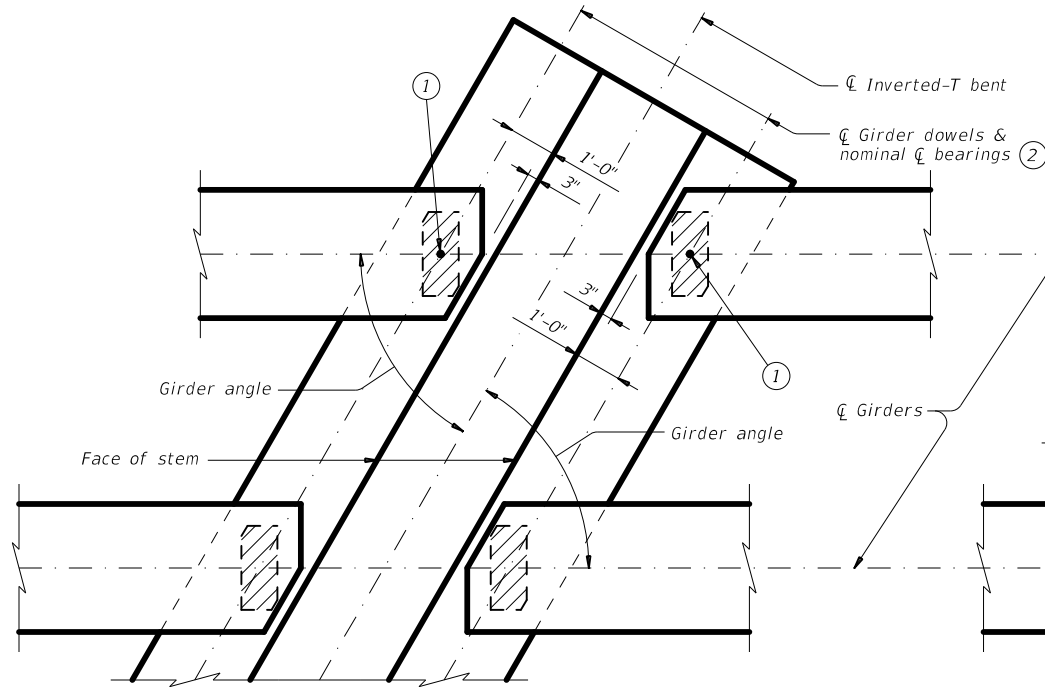
**PRESTRESSED CONCRETE I-GIRDER DETAILS**

**IGD**

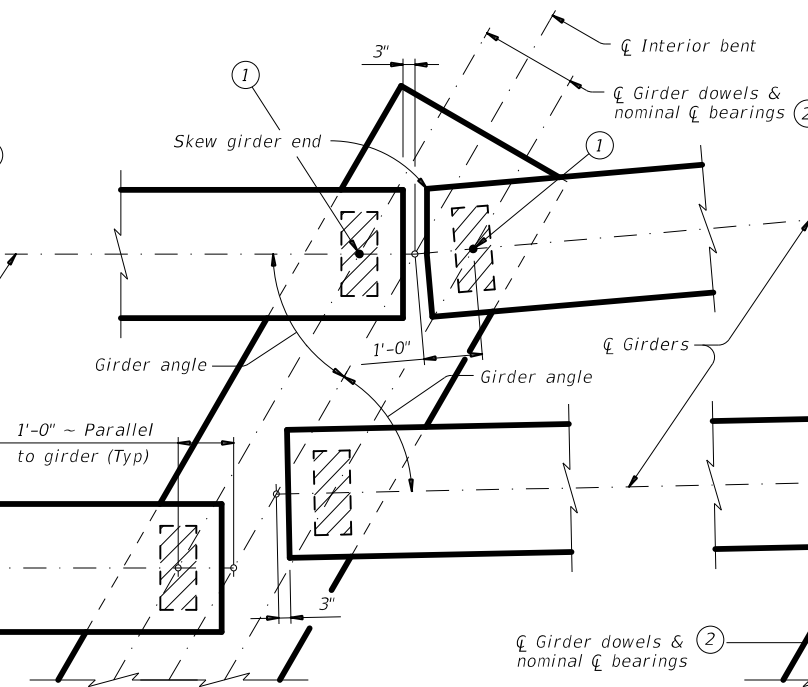
FILE:	DN: TxDOT	CK: JMH	DW: JTR	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0923	17	084	CR 392
10-19: Added Bars C and CH full length for VC=20	DIST	COUNTY	SHEET NO.	
3-23: Clari ed C and CH requirement	BWD	COMANCHE	52	

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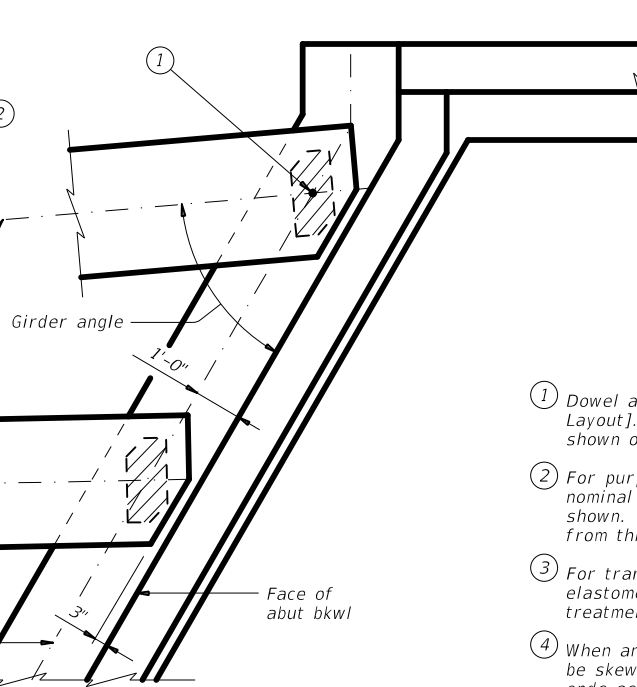
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AT INVERTED-T BENT W/SKEW

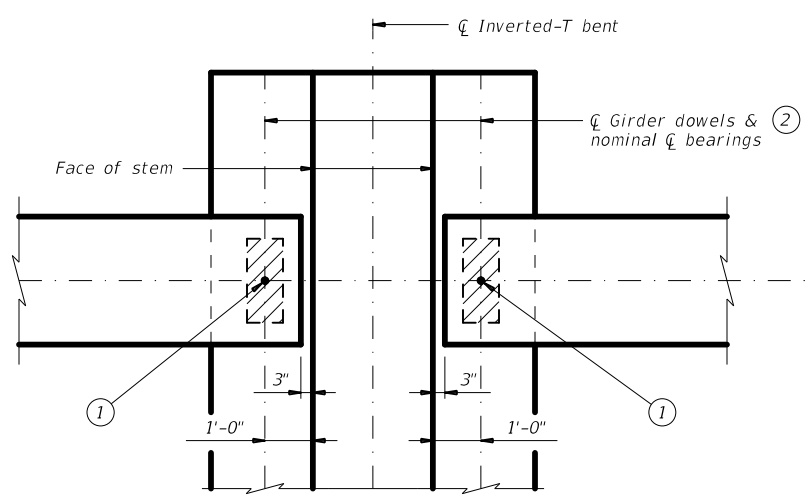


AT CONVENTIONAL INTERIOR BENT W/SKEW

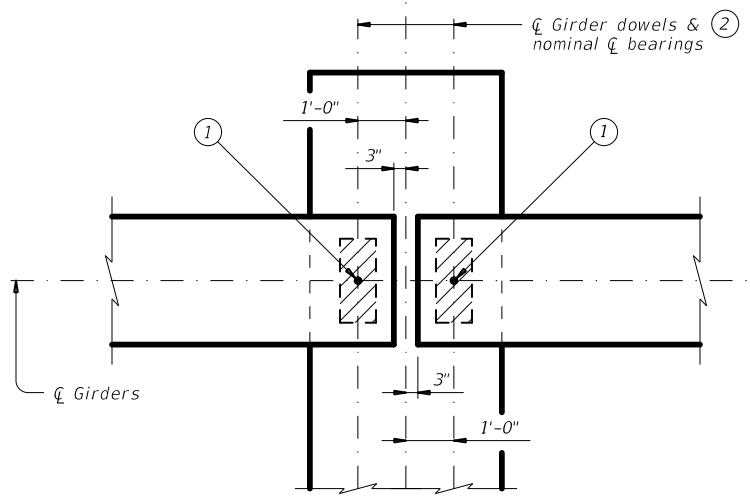


AT ABUTMENT W/SKEW

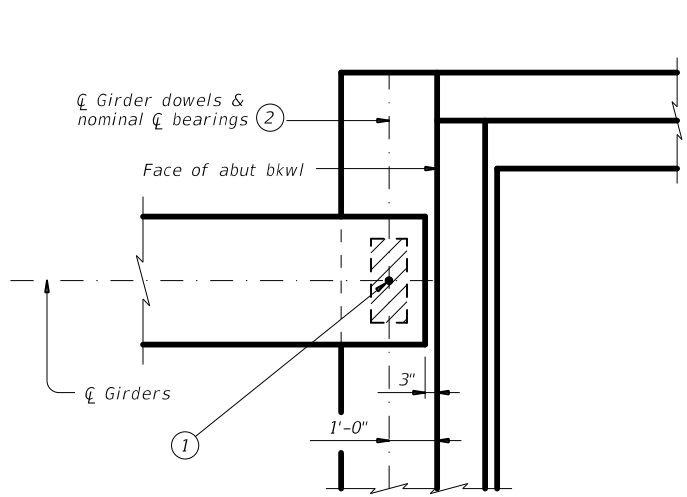
- ① Dowel at doweled girder end [labeled (D) on Bridge Layout]. Required for outside girder only or as shown on substructure details.
- ② For purposes of computing bearing seat elevations, nominal centerline of bearing must be defined as shown. The actual center of bearing pad may vary from this line.
- ③ For transition bents with backwall, girder and elastomeric bearings must receive the same treatment as shown for abutments.
- ④ When angle exceeds 0°, one or both girder ends must be skewed to maintain the clearance between girder ends as shown in view.
- ⑤ See Table of Bearing Pad Dimensions for bearing size. Girder end skew angles in Table not applicable for this situation. Table reflects girder conflicts of this type on radial bents only.



AT INVERTED-T BENT



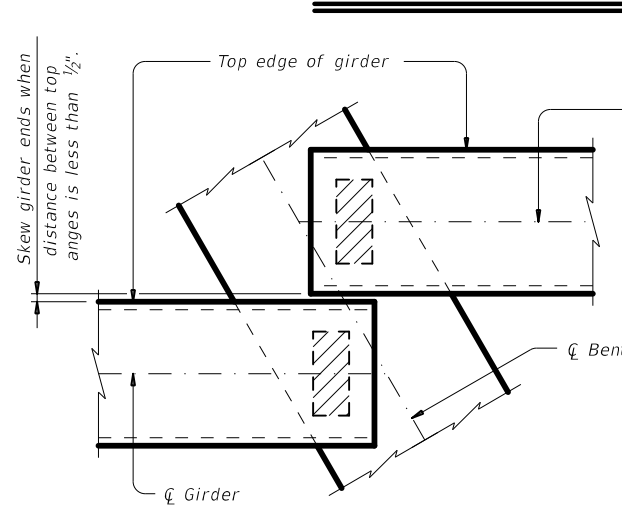
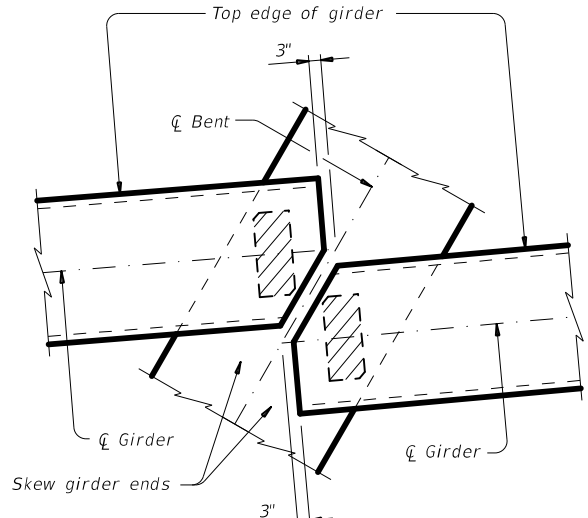
AT CONVENTIONAL INTERIOR BENT



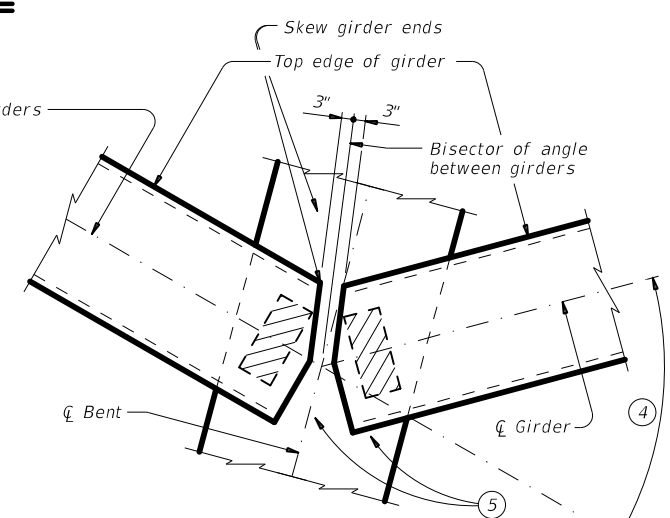
AT ABUTMENT

**GENERAL NOTES:**  
 These details accommodate skew angles up to 60°. Shop drawings for approval are required. A bearing layout which identifies location and orientation of all bearings must be developed by the bearing fabricator. Permanently mark each bearing in accordance with the bearing layout. A copy of the bearing layout is to be provided to the Engineer. Cost of furnishing and installing elastomeric bearings, including beveled and embedded steel plates, must be included in unit price bid for "Prestressed Concrete Girders".

**GIRDER END DETAILS**



**GIRDER CONFLICT DETAILS**



HL93 LOADING SHEET 1 OF 3

**Texas Department of Transportation** Bridge Division Standard

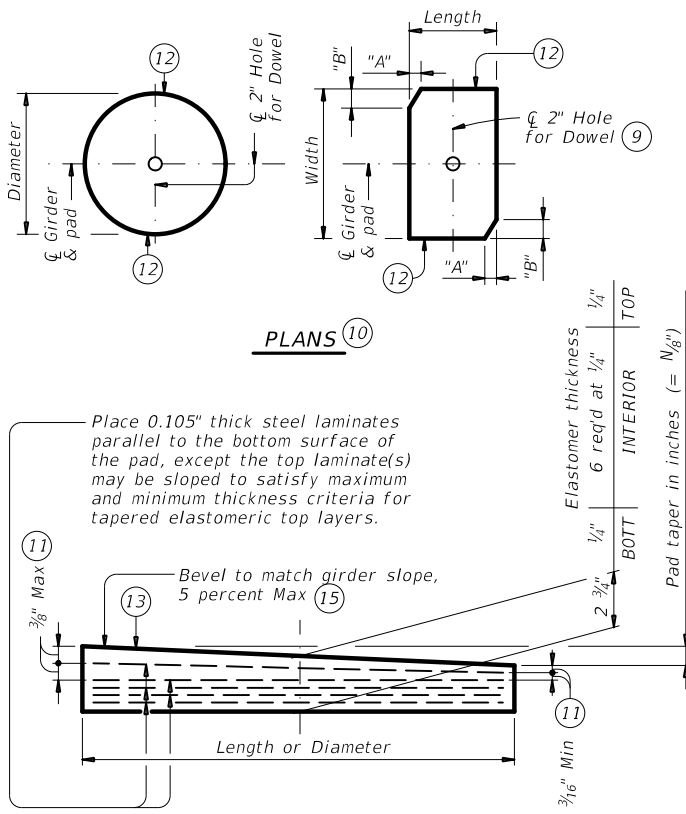
**ELASTOMERIC BEARING AND GIRDER END DETAILS**  
**PRESTR CONCRETE I-GIRDERS**

**IGEB**

FILE: IG-IGEB-17.dgn	DN: AEE	CK: JMH	DW: JTR	CK: TxDOT
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0923	17	084	CR 392
	DIST	COUNTY	SHEET NO.	
	BWD	COMANCHE	53	

12/19/2023 4:00:58 PM  
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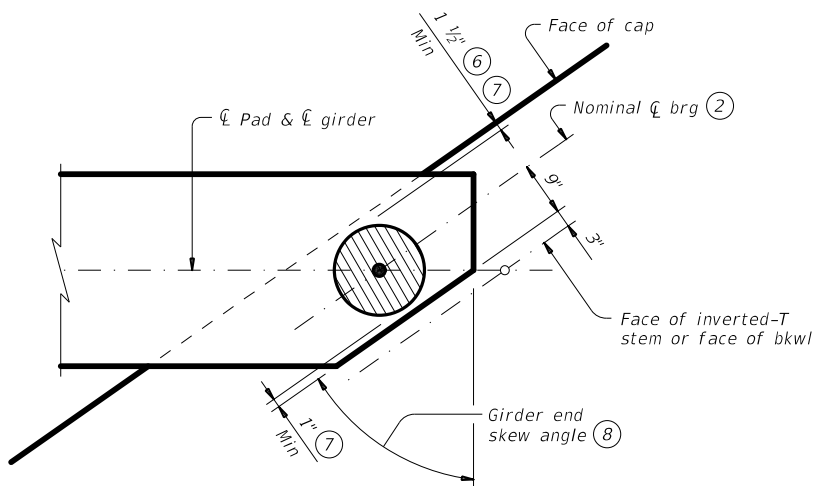
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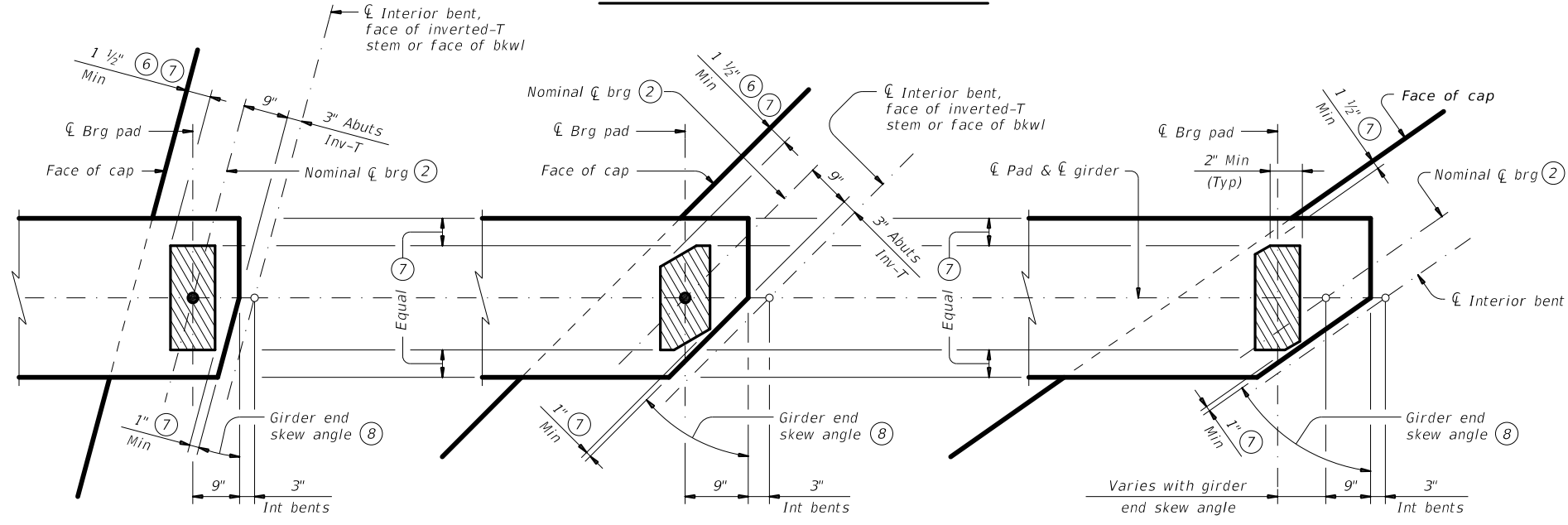
**LAMINATED ELASTOMERIC BEARING PAD**  
(50 DUROMETER)

Girder Type	Abutments	Int Bents	Inv-T Bents
	Face of Bkwl to Face of Cap	Overall Cap Width	Corbel Width
Tx28 thru Tx54	1'-9"	3'-6"	1'-10 1/2"
Tx62 & Tx70	2'-0"	4'-0"	2'-1 1/2"

Bent Type	Girder Type	Bearing Type (13)	Girder End Skew Angle Range	Pad Size Lgth x Wdth	Pad Clip Dimensions	
					"A"	"B"
ABUTMENTS, INVERTED-T AND TRANSITION BENTS WITH BACKWALLS	Tx28, Tx34, Tx40, Tx46 & Tx54	G-1-"N"	0° thru 21°	8" x 21"	---	---
		G-2-"N"	21°+ thru 30°	8" x 21"	1 1/2"	2 1/2"
		G-3-"N"	30°+ thru 45°	9" x 21"	4 1/2"	4 1/2"
		G-4-"N"	45°+ thru 60°	15" Dia	---	---
	Tx62 & Tx70	G-5-"N"	0° thru 21°	9" x 21"	---	---
		G-6-"N"	21°+ thru 30°	9" x 21"	1 1/2"	2 1/2"
		G-7-"N"	30°+ thru 45°	10" x 21"	4 1/2"	4 1/2"
		G-8-"N"	45°+ thru 60°	10" x 21"	7 1/4"	4 1/4"
CONVENTIONAL INTERIOR BENTS	Tx28, Tx34, Tx40, Tx46 & Tx54	---	---	---	---	---
	Tx62 & Tx70	G-5-"N"	0° thru 60°	9" x 21"	---	---
CONVENTIONAL INTERIOR BENTS WITH SKEWED GIRDER ENDS (GIRDER CONFLICTS)	Tx28, Tx34, Tx40, Tx46 & Tx54	G-1-"N"	0° thru 18°	8" x 21"	---	---
		G-2-"N"	18°+ thru 30°	8" x 21"	1 1/2"	2 1/2"
		G-9-"N"	30°+ thru 45°	8" x 21"	3"	3"
		G-10-"N"	45°+ thru 60°	9" x 21"	6"	3 1/2"
	Tx62 & Tx70	G-5-"N"	0° thru 18°	9" x 21"	---	---
		G-5-"N"	18°+ thru 30°	9" x 21"	---	---
		G-11-"N"	30°+ thru 45°	9" x 21"	1 1/2"	1 1/2"
		G-12-"N"	45°+ thru 60°	9" x 21"	3"	1 3/4"



**ROUND BEARINGS FOR SKEWED GIRDER ENDS AT FACE OF INVERTED-T STEM OR FACE OF BKWL**



**SKEWED GIRDER ENDS AT INT BENTS, FACE OF INVERTED-T STEM OR FACE OF BKWL**

**SKEWED GIRDER ENDS AT CONVENTIONAL INTERIOR BENTS (NO GIRDER DOWELS)**

**BEARING PAD PLACEMENT DIAGRAMS**

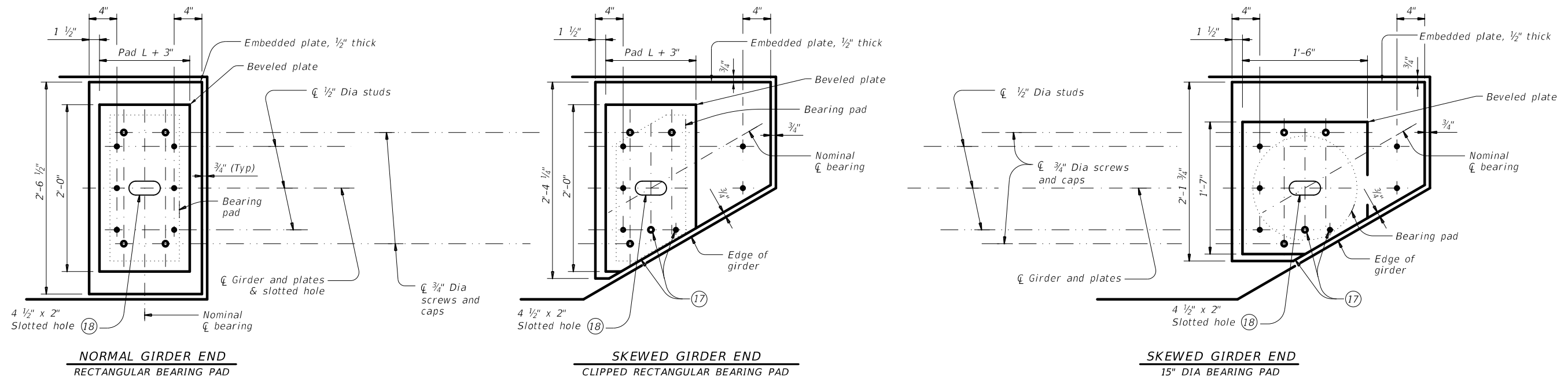
- (2) For purposes of computing bearing seat elevations, nominal centerline of bearing must be defined as shown. The actual center of bearing pad may vary from this line.
- (6) 3" for inverted-T.
- (7) Place centerline pad as near nominal centerline bearing as possible between limits shown.
- (8) Girder end skew angle is equal to 90° minus the girder angle except at some conflicting girders.
- (9) Provide 2" dia hole only at locations required. See Substructure details for location.
- (10) See Table of Bearing Pad Dimensions for dimensions.
- (11) Maximum and minimum layer thicknesses shown are for elastomer only, on tapered layers.
- (12) Locate Permanent Mark here.
- (13) Indicate BEARING TYPE on all pads. For tapered pads, locate BEARING TYPE on the high side. The Fabricator must include the value of "N" (amount of taper in 1/8" increments) in this mark.  
 Examples: N=0, (for 0° taper)  
 N=1, (for 1/8" taper)  
 N=2, (for 1/4" taper)  
 (etc.)  
 Fabricated pad top surface slope must not vary from plan girder slope by more than  $\left(\frac{0.0625}{\text{Length or Dia}}\right)$  IN/IN.
- (14) Substructure dimensions must satisfy the minimums provided to accommodate the elastomeric bearings shown on this standard.
- (15) See sheet 3 of 3 for beveled plate use when slopes exceed 5 percent.
- (16) If girder end is skewed for a girder conflict at an interior bent and a beveled sole plate is required, use bearing type for abutments at this location. Location of bearing centerline is to be set as for abutments in this case.

HL93 LOADING SHEET 2 OF 3

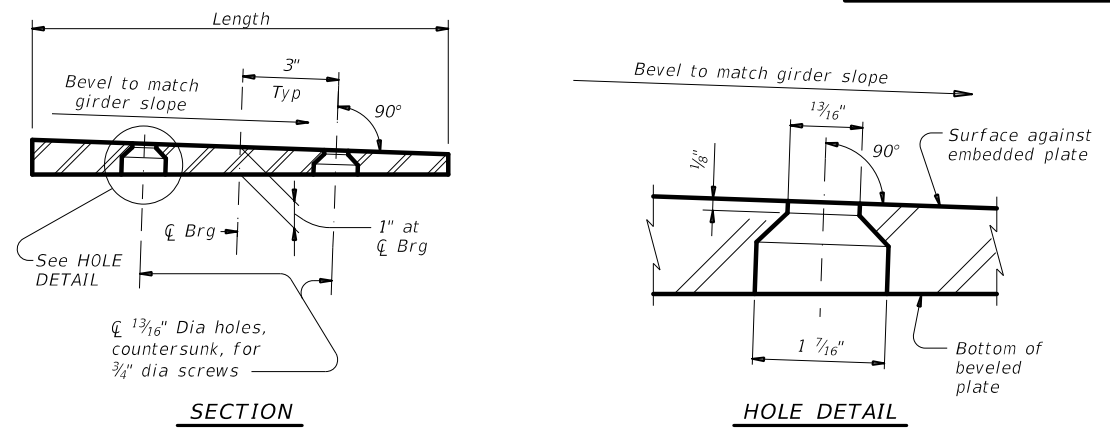
		<b>Bridge Division Standard</b>	
<b>ELASTOMERIC BEARING AND GIRDER END DETAILS</b> <b>PRESTR CONCRETE I-GIRDERS</b>			
<b>IGEB</b>			
FILE: IG-IGEB-17.dgn	DN: AEE	CK: JMH	DW: JTR
©TxDOT August 2017	CONT SECT	JOB	HIGHWAY
REVISIONS	0923 17	084	CR 392
DIST	COUNTY	SHEET NO.	
BWD	COMANCHE	54	

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**PLAN VIEW OF SOLE PLATE DETAILS**



**BEVELED PLATE DETAILS**

- 17 Cut beveled and embedded plates to match girder end skew. Adjust location of screw and stud as shown when necessary.
- 18 Slotted hole is required at doweled girder end locations.

**SOLE PLATE NOTES:**

Provide constant thickness elastomeric bearings with beveled and embedded steel sole plates in accordance with these details when the girder slope exceeds 5 percent or if otherwise required in the plans. Provide for all girders in the span.

On the shop drawings, dimension sole plates to the nearest 1/16" based on required thickness at centerline of bearing and slope of girder. Thickness tolerance variation from the approved shop drawings is 1/16" +/-, except variation from a plane parallel to the theoretical top surface can not exceed 1/16" total. Bearing surface tolerances listed in Item 424 apply to embedded and beveled plates.

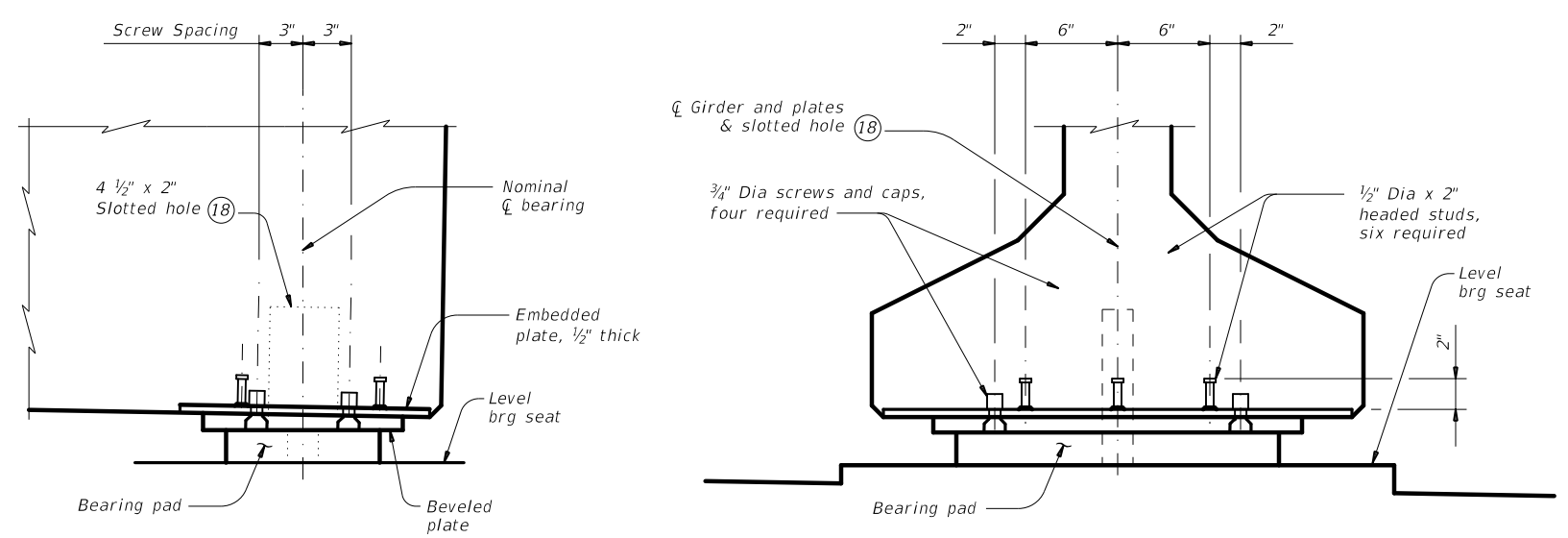
Steel plate must conform to ASTM A36, A572 Gr 50, or A709 Gr 36 or Gr 50. Hot dip galvanize both the embedded plate and beveled sole plate after fabrication. Seal weld caps to embedded plate before galvanizing.

When determining if relocation of screw holes and studs are necessary for skewed girder ends, minimum clearance from screw or stud centerline to plate edge is 1.25".

Tap threads in the embedded plate only. Drill and tap prior to galvanizing.

3/4" Dia screws must be electroplated, socket at head countersunk cap screws conforming to ASTM F835. Electroplating must conform to ASTM B633, SC 2, Type I. Provide screws long enough to maintain a 3/4" minimum embedment into the embedded plate and galvanized cap. Provide galvanized steel caps (16 ga Min) with a nominal 1" inside diameter and deep enough to accommodate the screws, but not less than 1/2" deep or deeper than 1".

Install beveled sole plates prior to shipping girders. Installed screw heads must not protrude below the bottom of the beveled plate.



**GIRDER DETAILS**

HL93 LOADING SHEET 3 OF 3

Texas Department of Transportation  
 Bridge Division Standard

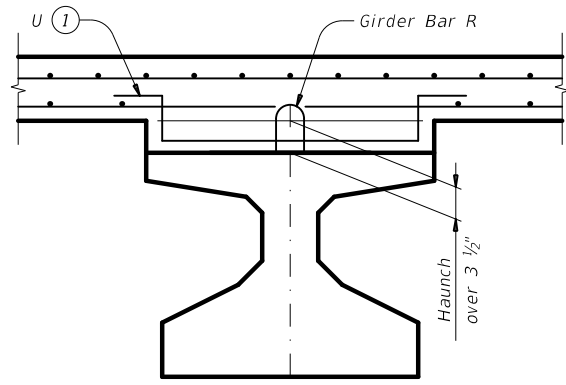
**ELASTOMERIC BEARING AND GIRDER END DETAILS  
PRESTR CONCRETE I-GIRDERS**

**IGEB**

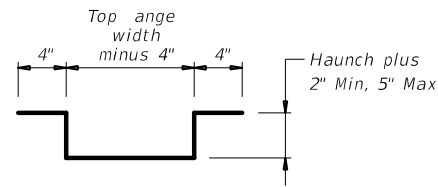
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0923 17	August 2017	CONTRACT	SECTION	JOB
	REVISIONS	084		CR 392
		DIST	COUNTY	SHEET NO.
		BWD	COMANCHE	55

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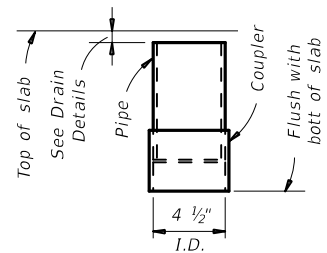
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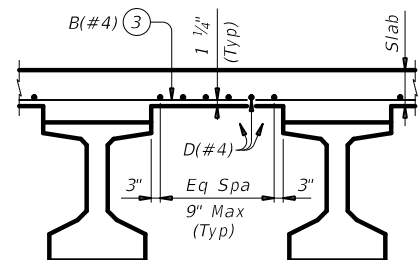
**HAUNCH REINFORCING DETAIL**



**BARS U (#4)**

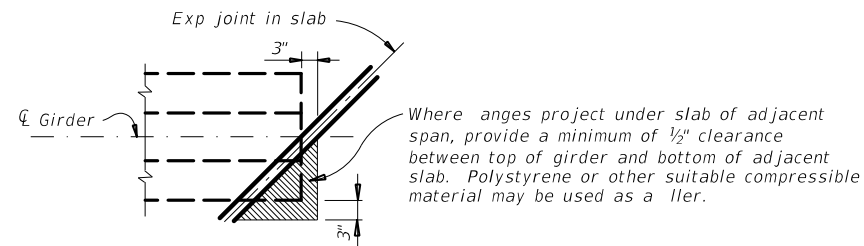


**C-I-P DRAIN DETAIL**

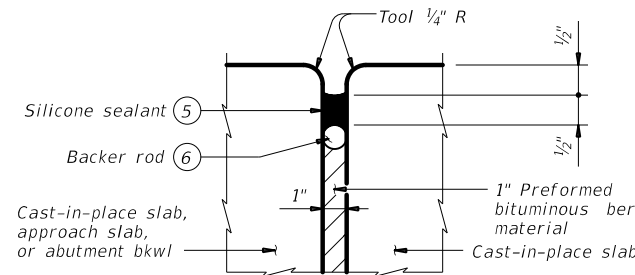


**TYPICAL PART TRANSVERSE SLAB SECTION WITHOUT PCP**

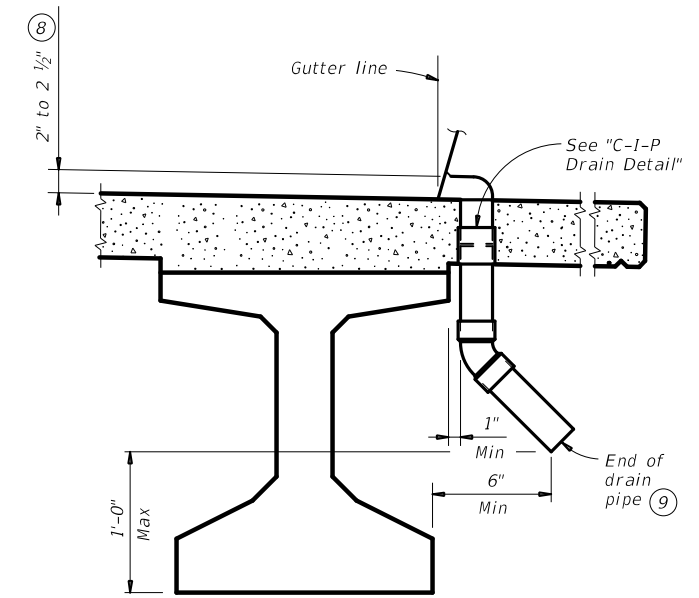
Top reinforcing steel not shown for clarity.



**TREATMENT AT GIRDER END FOR SKEWED SPANS**



**TYPE A JOINT DETAIL**



**DRAIN DETAIL**

**GENERAL NOTES:**  
 Designed according to AASHTO LRFD Bridge Design Specifications.  
 Payment for Type A joint will be as per Item 454, "Bridge Expansion Joints."  
 All other items (reinforcing steel, drains, etc.) shown on this sheet are subsidiary to other bid items.

Cover dimensions are clear dimensions, unless noted otherwise.  
 Reinforcing bar dimensions shown are out-to-out of bar.

**DECK FORMWORK NOTES:**  
 Overhang bracket hangers are limited to a safe working load of 3,600 lbs, applied to and along the axis of a coil rod at 45 degrees from vertical, regardless of higher loads permitted by hanger manufacturers. Do not place a hanger less than 12" from girder end. Space hangers accordingly.

- ① Space Bars U with girder Bars R in all areas where measured haunch exceeds 3 1/2".
- ② Roughen outside of PVC with coarse rasp or equal to ensure bond with cast-in-place concrete.
- ③ Bars B(#4) spaced at 9" Max with 2" end cover. Overhang option, Contractor's may end alternating bars B(#4) at centerline outside girder.
- ④ Provide Grade 60 reinforcing steel. Provide bar laps, where required, as follows:  
 Uncoated ~ #4 = 1'-7"  
 Epoxy coated ~ #4 = 2'-5"
- ⑤ Class 7 silicone sealant that conforms to DMS-6310. Install when ambient temperature is between 55°F and 85°F and rising. Engineer to determine allowable hours for sealant application.
- ⑥ 1 1/4" backer rod must be compatible with joint sealant. Use of multiple pieces to create a backer rod cross section is not permitted. Top of backer rod must be convex as shown.
- ⑦ The maximum distance between Type A expansion joints is 100'. See Bridge Layout for location of joints.
- ⑧ Drain entrance formed in rail or sidewalk.
- ⑨ Water may not be discharged onto girders.
- ⑩ All drain pipe and fittings to be 4" diameter (Sch 40) PVC. See Item 481 "Pipe for Drains" for pipe, connections and solvent welding. Bend reinforcing steel to clear PVC 1". Drain length and location is as directed by the Engineer. Drains are not permitted over roadways or railroads, or within 10'-0" of bent caps. Degrease outside of exposed PVC, apply acrylic water base primer, then coat with same surface finishing material as used for outside girder face. Variations of the above designs, as required for the type of rail used and its location on the structure, may be installed with the approval and direction of the Engineer.

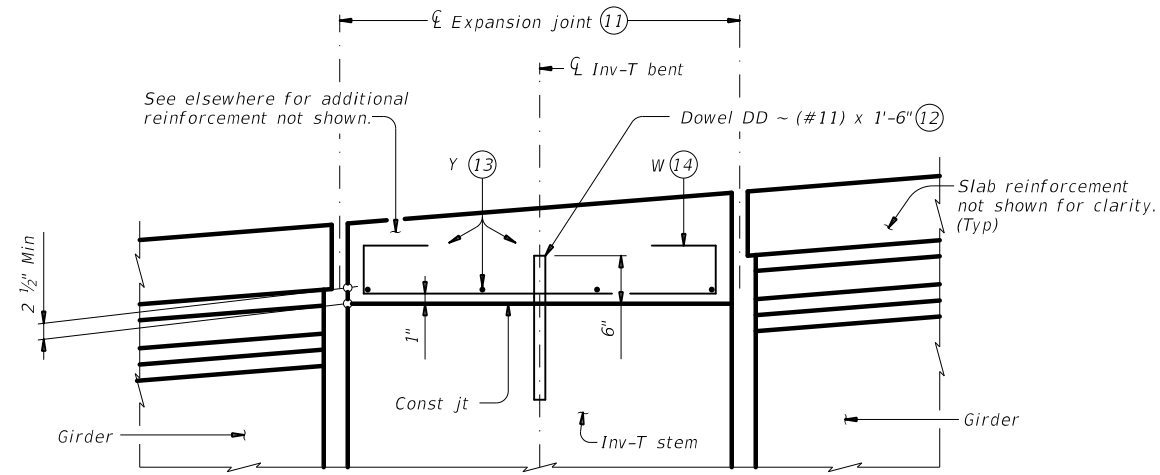
SHEET 1 OF 2

		<b>Bridge Division Standard</b>	
<b>MISCELLANEOUS SLAB DETAILS</b> <b>PRESTR CONCRETE I-GIRDERS</b>			
<b>IGMS</b>			
FILE: IG-IGMS-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR
©TxDOT August 2017	CONT	SECT	HIGHWAY
REVISIONS	0923	17	084 CR 392
10-19: Modified Note 7, Type A now a pay item.	DIST	COUNTY	SHEET NO.
	BWD	COMANCHE	56

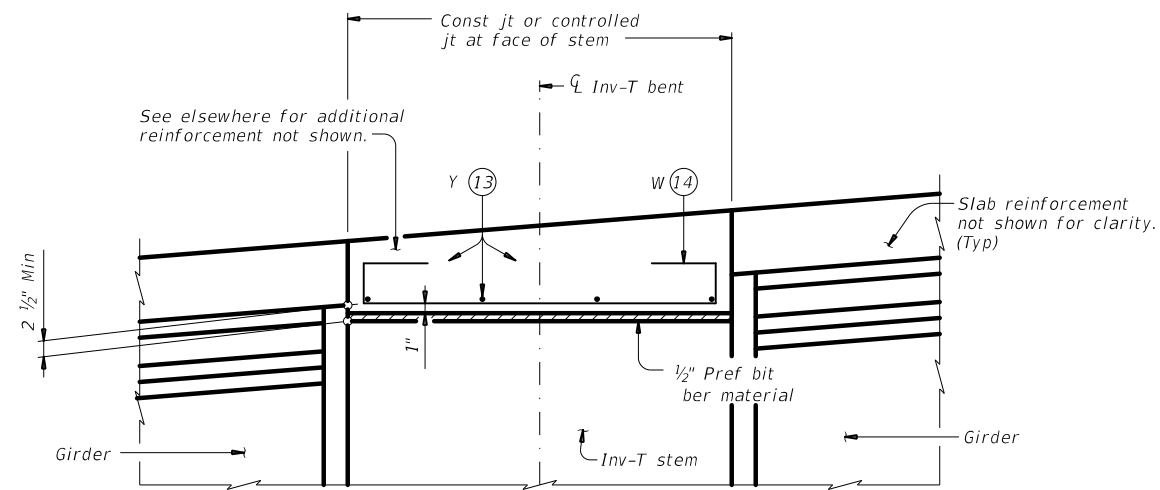


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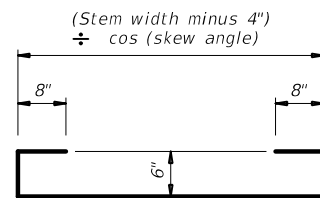
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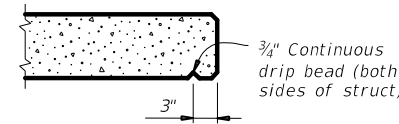
**SHOWING EXPANSION JOINTS**



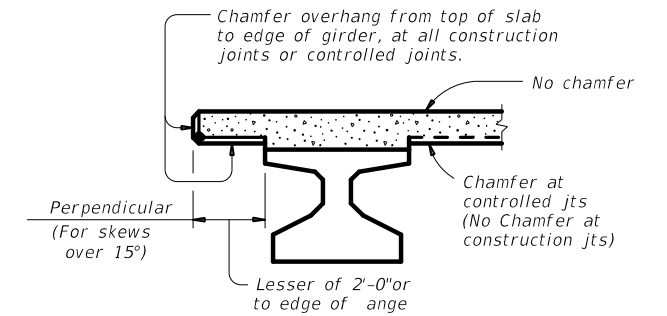
**SHOWING CONST JTS OR CONTROLLED JTS  
REINFORCEMENT OVER INV-T BENTS**



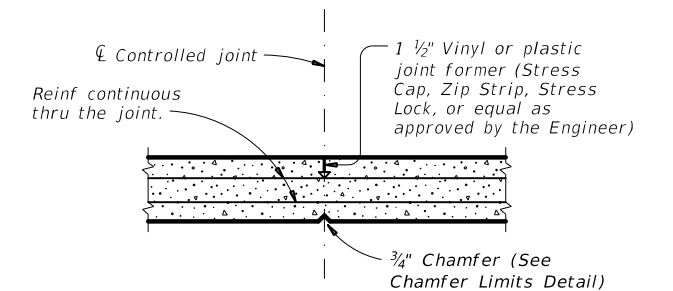
**BARS W (#4)**



**DRIP BEAD DETAIL**



**CHAMFER LIMITS DETAIL (15)**



**CONTROLLED JOINT DETAIL**  
(Saw-cutting is not allowed)

- (11) See Layout for joint type.
- (12) Dowels DD (#11) spaced at 5 Ft Max. See Inv-T bents for quantity and location.
- (13) Space Bars Y (#4) at 12" Max. Use 2" end cover. Number of Bars Y must satisfy spacing limit. Place parallel to bent.
- (14) Space Bars W at 12" Max (3" from end of cap). Tilt if necessary to maintain cover requirements. Place parallel to longitudinal slab reinforcement.
- (15) See Span details for type of joint and joint locations.

SHEET 2 OF 2



**MISCELLANEOUS  
SLAB DETAILS  
PRESTR CONCRETE I-GIRDERS**

**IGMS**

FILE: IG-IGMS-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: TxDOT
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REVISIONS	0923	17	084	CR 392
10-19: Modified Note 7, Type A now a pay item.	DIST	COUNTY	SHEET NO.	
	BWD	COMANCHE	57	

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STRUCTURE	DESIGNED GIRDERS									DEPRESSED STRAND PATTERN		CONCRETE		OPTIONAL DESIGN					LOAD RATING FACTORS			NON-STANDARD STRAND PATTERNS	
	SPAN NO.	GIRDER NO.	GIRDER TYPE	PRESTRESSING STRANDS					NO.	TO END (in)	RELEASE STRGTH (1) f'ci (ksi)	MINIMUM 28 DAY COMP STRGTH f'c (ksi)	DESIGN LOAD COMP STRESS (TOP $\epsilon$ ) (SERVICE I) fct(ksi)	DESIGN LOAD TENSILE STRESS (BOTT $\epsilon$ ) (SERVICE III) fcb(ksi)	REQUIRED MINIMUM ULTIMATE MOMENT CAPACITY (STRENGTH I) (kip-ft)	LIVE LOAD DISTRIBUTION FACTOR (2)		STRENGTH I		SERVICE III	PATTERN	STRAND ARRANGEMENT AT $\epsilon$ OF GIRDER	
				NON-STD STRAND PATTERN	TOTAL NO.	SIZE (in)	STRGTH f <sub>pu</sub> (ksi)	"e" $\epsilon$ (in)								"e" END (in)	Moment	Shear	Inv	Opr			Inv
Type Tx28 Girders 24' Roadway 8.5" Slab	40	ALL	Tx28		10	0.6	270	10.48	10.48			4.000	5.000	1.055	-1.423	1382	0.670	0.850	1.56	2.02	1.98		
	45	ALL	Tx28		12	0.6	270	10.48	10.48			4.500	5.000	1.332	-1.744	1525	0.650	0.850	1.58	2.05	1.79		
	50	ALL	Tx28		12	0.6	270	10.48	10.48			4.200	5.000	1.645	-2.113	1657	0.630	0.860	1.25	1.62	1.25		
	55	ALL	Tx28		14	0.6	270	10.48	9.62	2	8.5	4.000	5.000	1.969	-2.490	1919	0.610	0.860	1.27	1.64	1.11		
	60	ALL	Tx28		18	0.6	270	10.04	7.81	4	14.5	4.000	5.600	2.320	-2.901	2206	0.600	0.870	1.43	1.86	1.14		
	65	ALL	Tx28		22	0.6	270	9.75	6.12	4	24.5	4.300	5.900	2.716	-3.337	2486	0.580	0.870	1.55	2.00	1.14		
	70	ALL	Tx28		26	0.6	270	9.56	6.48	4	24.5	5.200	6.300	3.131	-3.802	2793	0.570	0.870	1.26	1.89	1.01		
	75	ALL	Tx28		28	0.6	270	9.48	6.62	4	24.5	5.600	7.800	3.572	-4.291	3110	0.560	0.880	1.38	1.81	1.08		
Type Tx34 Girders 24' Roadway 8.5" Slab	40	ALL	Tx34		10	0.6	270	13.01	13.01			4.000	5.000	0.835	-1.089	1605	0.690	0.830	1.85	2.40	2.60		
	45	ALL	Tx34		10	0.6	270	13.01	13.01			4.500	5.500	1.050	-1.332	1750	0.670	0.840	1.90	2.46	2.42		
	50	ALL	Tx34		12	0.6	270	13.01	13.01			4.000	5.000	1.294	-1.612	1868	0.650	0.840	1.53	1.98	1.81		
	55	ALL	Tx34		12	0.6	270	13.01	13.01			4.000	5.000	1.553	-1.904	1981	0.630	0.840	1.24	1.61	1.33		
	60	ALL	Tx34		14	0.6	270	13.01	12.44	2	6.5	4.000	5.000	1.845	-2.231	2287	0.620	0.850	1.27	1.64	1.22		
	65	ALL	Tx34		16	0.6	270	12.76	11.76	4	8.5	4.000	5.000	2.161	-2.579	2605	0.610	0.850	1.25	1.62	1.06		
	70	ALL	Tx34		20	0.6	270	12.41	9.61	4	18.5	4.000	5.100	2.461	-2.902	2888	0.590	0.850	1.46	1.89	1.13		
	75	ALL	Tx34		24	0.6	270	12.18	7.84	4	30.5	4.300	5.400	2.818	-3.283	3223	0.580	0.860	1.57	2.04	1.15		
	80	ALL	Tx34		26	0.6	270	12.09	8.09	4	30.5	4.700	5.700	3.168	-3.660	3554	0.570	0.860	1.39	1.96	1.04		
	85	ALL	Tx34		30	0.6	270	11.81	7.81	6	26.5	5.400	6.100	3.567	-4.078	3909	0.560	0.860	1.46	2.00	1.04		
Type Tx40 Girders 24' Roadway 8.5" Slab	40	ALL	Tx40		10	0.6	270	15.60	15.60			4.000	5.000	0.697	-0.889	1671	0.720	0.820	2.10	2.73	3.15		
	45	ALL	Tx40		10	0.6	270	15.60	15.60			4.000	5.000	0.873	-1.080	1972	0.690	0.820	1.74	2.26	2.50		
	50	ALL	Tx40		12	0.6	270	15.60	15.60			4.000	5.000	1.065	-1.299	2276	0.670	0.830	1.78	2.31	2.33		
	55	ALL	Tx40		12	0.6	270	15.60	15.60			4.000	5.000	1.283	-1.538	2237	0.650	0.830	1.46	1.90	1.80		
	60	ALL	Tx40		14	0.6	270	15.60	15.60			4.200	5.000	1.522	-1.801	2434	0.640	0.830	1.49	1.93	1.66		
	65	ALL	Tx40		14	0.6	270	15.60	15.60			4.000	5.000	1.780	-2.081	2688	0.630	0.840	1.24	1.60	1.25		
	70	ALL	Tx40		16	0.6	270	15.35	14.85	4	6.5	4.000	5.000	2.035	-2.349	2989	0.610	0.840	1.28	1.65	1.17		
	75	ALL	Tx40		18	0.6	270	15.16	14.27	4	8.5	4.000	5.000	2.328	-2.657	3337	0.600	0.840	1.28	1.66	1.05		
	80	ALL	Tx40		22	0.6	270	14.87	11.24	4	24.5	4.000	5.000	2.616	-2.961	3681	0.590	0.850	1.47	1.90	1.11		
	85	ALL	Tx40		26	0.6	270	14.68	9.76	4	36.5	4.400	5.100	2.930	-3.287	4041	0.580	0.850	1.60	2.08	1.22		
	90	ALL	Tx40		28	0.6	270	14.60	10.03	4	36.5	4.800	5.500	3.259	-3.626	4410	0.570	0.850	1.55	2.01	1.07		
	95	ALL	Tx40		32	0.6	270	14.23	8.60	6	36.5	5.100	5.800	3.620	-3.991	4799	0.560	0.850	1.62	2.10	1.06		
100	ALL	Tx40		36	0.6	270	13.93	8.93	6	36.5	5.800	6.600	4.006	-4.393	5245	0.560	0.850	1.47	1.94	1.06			
Type Tx46 Girders 24' Roadway 8.5" Slab	40	ALL	Tx46		10	0.6	270	17.60	17.60			4.000	5.000	0.613	-0.708	1732	0.740	0.810	2.35	3.05	3.78		
	45	ALL	Tx46		10	0.6	270	17.60	17.60			4.000	5.000	0.768	-0.865	2066	0.720	0.810	1.93	2.50	3.01		
	50	ALL	Tx46		12	0.6	270	17.60	17.60			4.000	5.000	0.937	-1.042	2452	0.700	0.820	1.97	2.55	2.81		
	55	ALL	Tx46		12	0.6	270	17.60	17.60			4.000	5.000	1.127	-1.235	2726	0.680	0.820	1.63	2.11	2.22		
	60	ALL	Tx46		14	0.6	270	17.60	17.60			4.000	5.000	1.332	-1.438	2951	0.660	0.820	1.68	2.18	2.10		
	65	ALL	Tx46		14	0.6	270	17.60	17.60			4.000	5.000	1.557	-1.662	2905	0.650	0.820	1.41	1.82	1.64		
	70	ALL	Tx46		14	0.6	270	17.60	17.60			4.000	5.000	1.798	-1.898	3157	0.640	0.830	1.18	1.52	1.25		
	75	ALL	Tx46		16	0.6	270	17.35	16.85	4	6.5	4.000	5.000	2.050	-2.137	3495	0.620	0.830	1.23	1.59	1.17		
	80	ALL	Tx46		18	0.6	270	17.16	16.27	4	8.5	4.000	5.000	2.304	-2.384	3859	0.610	0.830	1.25	1.63	1.09		
	85	ALL	Tx46		22	0.6	270	16.88	15.06	4	14.5	4.000	5.000	2.591	-2.656	4249	0.600	0.830	1.46	1.89	1.30		
	90	ALL	Tx46		24	0.6	270	16.77	14.10	4	20.5	4.000	5.000	2.870	-2.923	4631	0.590	0.840	1.45	1.88	1.06		
	95	ALL	Tx46		28	0.6	270	16.60	11.46	4	40.5	4.200	5.000	3.192	-3.234	5087	0.590	0.840	1.57	2.03	1.08		
	100	ALL	Tx46		32	0.6	270	16.23	9.48	6	42.5	4.400	5.000	3.524	-3.542	5513	0.580	0.840	1.65	2.14	1.07		
	105	ALL	Tx46		36	0.6	270	15.94	9.94	6	42.5	5.000	5.800	3.856	-3.851	5937	0.570	0.840	1.72	2.23	1.17		
	110	ALL	Tx46		38	0.6	270	15.81	10.45	6	40.5	5.400	6.300	4.200	-4.169	6370	0.560	0.840	1.67	2.16	1.04		
115	ALL	Tx46		42	0.6	270	15.60	10.75	6	40.5	6.000	7.000	4.584	-4.532	6886	0.560	0.840	1.46	1.96	1.05			

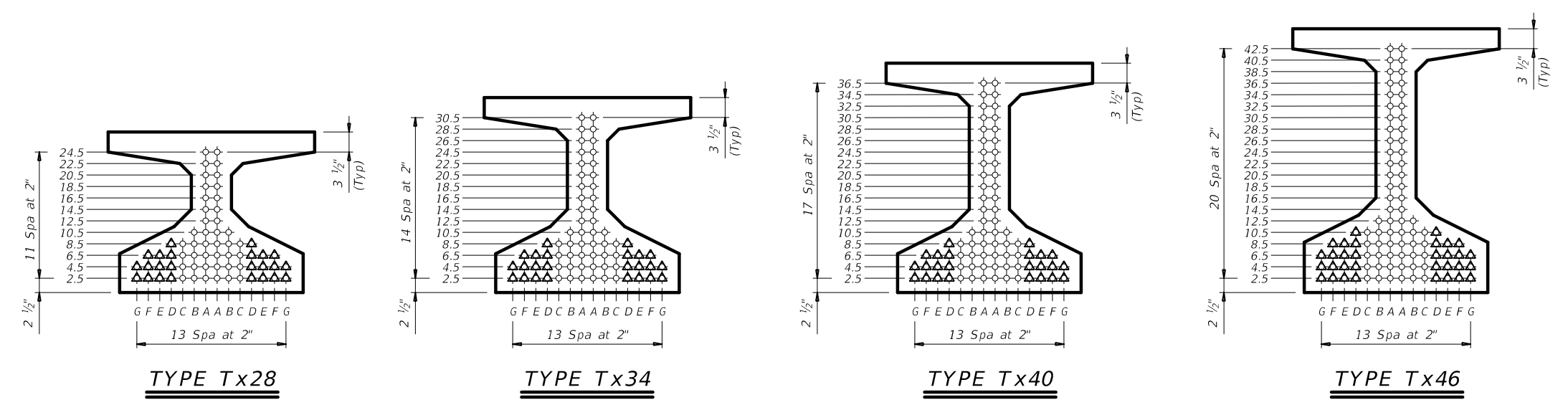
(1) Based on the following allowable stresses (ksi):  
 Compression = 0.65 f'ci  
 Tension = 0.24  $\sqrt{f'ci}$   
 Optional designs must likewise conform.  
 (2) Portion of full HL93.

**DESIGN NOTES:**  
 Designed according to AASHTO LRFD Bridge Design Specifications.  
 Load rated and Resistance Factor Rating according to AASHTO Manual for Bridge Evaluation.  
 Optional designs for girders 120 feet or longer must have a calculated residual camber equal to or greater than that of the designed girder.  
 Prestress losses for the designed girders have been calculated for a relative humidity of 60 percent. Optional designs must likewise conform.

**FABRICATION NOTES:**  
 Provide Class H concrete.  
 Provide Grade 60 reinforcing steel bars.  
 Use low relaxation strands, each pretensioned to 75 percent of f<sub>pu</sub>.  
 Strand debonding must comply with Item 424.4.2.2.4. Full-length debonded strands are only permitted in positions marked  $\Delta$ . Double wrap full-length debonded strands in outer most position of each row.

When shown on this sheet, the Fabricator has the option of furnishing either the designed girder or an approved optional design. All optional design submittals must be signed, sealed and dated by a Professional Engineer registered in the State of Texas.  
 Seal cracks in girder ends exceeding 0.005" in width as directed by the Engineer. The fabricator is permitted to decrease the spacing of Bars R and S by providing additional bars to help limit crack width provided the decreased spacing results in no less than 1" clear between bars. The fabricator must take an approved corrective action if cracks greater than 0.005" form on a repetitive basis.

**DEPRESSED STRAND DESIGNS:**  
 Locate strands for the designed girder as low as possible on the 2" grid system unless a non-standard strand pattern is indicated. Fill row "2.5", then row "4.5", then row "6.5", etc., beginning each row in the "A" position and working outward until the required number of strands is reached. All strands in the "A" position must be depressed, maintaining the 2" spacing so that, at the girder ends, the upper two strands are in the position shown in the table.



HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation  
 Bridge Division Standard

## PRESTRESSED CONCRETE I-GIRDER STANDARD DESIGNS

### 24' ROADWAY

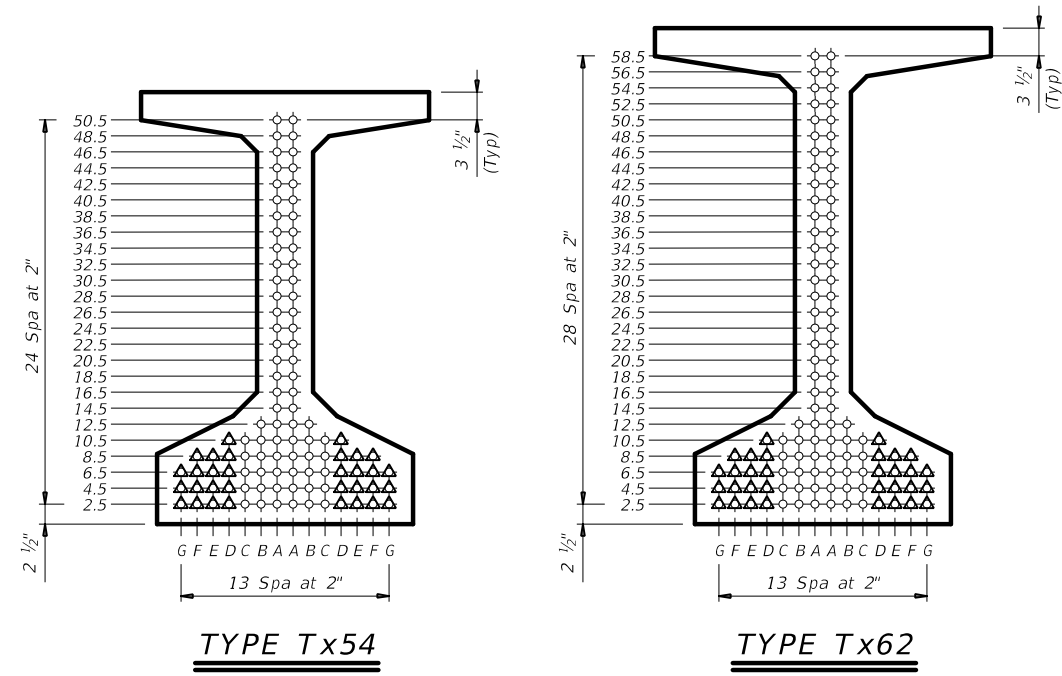
### IGSD-24

FILE: IG-IGSD24-21.dgn	DN: EFC	CK: AJF	DW: EFC	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
10-19: Redesign girders. 1-21: Added load rating.	0923	17	084	CR 392
	DIST	COUNTY	SHEET NO.	
	BWD	COMANCHE	58	

12/19/2023 4:01:02 PM  
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 FILE: No warranty of any kind is made by TxDOT for any purpose whatsoever. The use of this standard is governed by the "Texas Engineering Practice Act". TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

STRUCTURE	DESIGNED GIRDERS									DEPRESSED STRAND PATTERN		CONCRETE		OPTIONAL DESIGN					LOAD RATING FACTORS			NON-STANDARD STRAND PATTERNS				
	SPAN NO.	GIRDER NO.	GIRDER TYPE	PRESTRESSING STRANDS					NO.					TO END (in)	RELEASE STRGTH (1) f'ci (ksi)	MINIMUM 28 DAY COMP STRGTH f'c (ksi)	DESIGN LOAD COMP STRESS (TOP ε) (SERVICE I) Fct(ksi)	DESIGN LOAD TENSILE STRESS (BOT ε) (SERVICE III) fcb(ksi)	REQUIRED MINIMUM ULTIMATE MOMENT CAPACITY (STRENGTH I) (kip-ft)	LIVE LOAD DISTRIBUTION FACTOR (2)				STRENGTH I		SERVICE III
				NON-STD STRAND PATTERN	TOTAL NO.	SIZE (in)	STRGTH fpu (ksi)	"e" ε (in)												"e" END (in)	Moment			Shear	Inv	Opr
Type Tx54 Girders 24' Roadway 8.5" Slab	40	ALL	Tx54		8	0.6	270	21.01	21.01			4.000	5.000	0.511	-0.578	1798	0.770	0.800	2.05	2.66	3.76					
	45	ALL	Tx54		10	0.6	270	21.01	21.01			4.000	5.000	0.636	-0.703	2126	0.740	0.800	2.24	2.90	3.69					
	50	ALL	Tx54		12	0.6	270	21.01	21.01			4.000	5.000	0.781	-0.850	2533	0.720	0.810	1.81	2.35	2.91					
	55	ALL	Tx54		12	0.6	270	21.01	21.01			4.000	5.000	0.938	-1.007	2951	0.700	0.810	1.90	2.46	2.79					
	60	ALL	Tx54		12	0.6	270	21.01	21.01			4.000	5.000	1.108	-1.173	3271	0.680	0.810	1.60	2.07	2.25					
	65	ALL	Tx54		14	0.6	270	21.01	21.01			4.000	5.000	1.285	-1.348	3547	0.670	0.810	1.66	2.16	2.16					
	70	ALL	Tx54		14	0.6	270	21.01	21.01			4.000	5.000	1.482	-1.540	3502	0.660	0.820	1.41	1.82	1.73					
	75	ALL	Tx54		16	0.6	270	20.76	20.26		4	6.5	4.000	5.000	1.689	-1.733	3745	0.640	0.820	1.47	1.91	1.66				
	80	ALL	Tx54		16	0.6	270	20.76	20.76				4.000	5.000	1.912	-1.944	4001	0.630	0.820	1.26	1.63	1.30				
	85	ALL	Tx54		18	0.6	270	20.56	19.67		4	8.5	4.000	5.000	2.148	-2.166	4406	0.620	0.820	1.07	1.39	1.00				
	90	ALL	Tx54		20	0.6	270	20.41	19.21		4	10.5	4.000	5.000	2.379	-2.384	4806	0.610	0.820	1.33	1.73	1.16				
	95	ALL	Tx54		22	0.6	270	20.28	18.46		4	14.5	4.000	5.000	2.639	-2.624	5234	0.600	0.820	1.35	1.75	1.07				
	100	ALL	Tx54		26	0.6	270	20.08	16.39		4	28.5	4.000	5.000	2.896	-2.871	5699	0.600	0.830	1.52	1.97	1.14				
	105	ALL	Tx54		30	0.6	270	19.81	12.21		6	44.5	4.000	5.000	3.180	-3.130	6153	0.590	0.830	1.51	1.96	1.02				
	110	ALL	Tx54		32	0.6	270	19.63	11.38		6	50.5	4.100	5.000	3.477	-3.400	6619	0.580	0.830	1.63	2.12	1.03				
115	ALL	Tx54		36	0.6	270	19.34	12.01		6	50.5	4.700	5.500	3.786	-3.679	7096	0.570	0.830	1.60	2.07	1.00					
120	ALL	Tx54		38	0.6	270	19.22	13.22		6	44.5	5.200	6.100	4.116	-3.985	7646	0.570	0.830	1.65	2.14	1.01					
125	ALL	Tx54		42	0.6	270	19.01	12.72		6	50.5	5.600	6.600	4.415	-4.257	8113	0.560	0.830	1.71	2.24	1.09					
Type Tx62 Girders 24' Roadway 8.5" Slab	60	ALL	Tx62		12	0.6	270	25.78	25.78			4.000	5.000	0.878	-0.986	3525	0.700	0.800	1.81	2.35	2.73					
	65	ALL	Tx62		12	0.6	270	25.78	25.78			4.000	5.000	1.016	-1.133	3847	0.690	0.800	1.89	2.45	2.64					
	70	ALL	Tx62		14	0.6	270	25.78	25.78			4.000	5.000	1.171	-1.293	4173	0.680	0.810	1.61	2.08	2.16					
	75	ALL	Tx62		14	0.6	270	25.78	25.78			4.000	5.000	1.332	-1.455	4132	0.660	0.810	1.68	2.18	2.10					
	80	ALL	Tx62		16	0.6	270	25.53	25.53			4.000	5.000	1.506	-1.633	4429	0.650	0.810	1.45	1.88	1.72					
	85	ALL	Tx62		16	0.6	270	25.53	25.53			4.000	5.000	1.691	-1.819	4610	0.640	0.810	1.24	1.61	1.37					
	90	ALL	Tx62		16	0.6	270	25.53	25.53			4.000	5.000	1.885	-2.013	5051	0.630	0.810	1.29	1.68	1.31					
	95	ALL	Tx62		20	0.6	270	25.18	24.78		4	6.5	4.000	5.000	2.081	-2.209	5493	0.620	0.820	1.11	1.44	1.02				
	100	ALL	Tx62		22	0.6	270	25.05	23.96		4	10.5	4.000	5.000	2.295	-2.420	5959	0.610	0.820	1.16	1.50	1.01				
	105	ALL	Tx62		24	0.6	270	24.94	23.28		4	14.5	4.000	5.000	2.514	-2.642	6475	0.610	0.820	1.37	1.78	1.10				
	110	ALL	Tx62		26	0.6	270	24.85	22.70		4	18.5	4.000	5.000	2.723	-2.850	6936	0.600	0.820	1.39	1.80	1.03				
	115	ALL	Tx62		30	0.6	270	24.58	17.78		6	40.5	4.000	5.000	2.963	-3.083	7440	0.590	0.820	1.56	2.02	1.09				
	120	ALL	Tx62		34	0.6	270	24.25	15.07		6	58.5	4.200	5.000	3.213	-3.325	7957	0.580	0.820	1.55	2.01	1.00				
	125	ALL	Tx62		36	0.6	270	24.11	17.11		6	48.5	4.700	5.600	3.480	-3.591	8551	0.580	0.820	1.64	2.13	1.04				
	130	ALL	Tx62		40	0.6	270	23.88	16.68		6	54.5	5.100	6.100	3.733	-3.836	9072	0.570	0.820	1.52	2.09	1.02				
135	ALL	Tx62		42	0.6	270	23.78	16.35		6	58.5	5.300	6.300	4.002	-4.104	9676	0.570	0.830	1.61	2.18	1.05					

(1) Based on the following allowable stresses (ksi):  
 Compression = 0.65 f'ci  
 Tension = 0.24 √f'ci  
 Optional designs must likewise conform.  
 (2) Portion of full HL93.



HL93 LOADING SHEET 2 OF 2

Bridge Division Standard

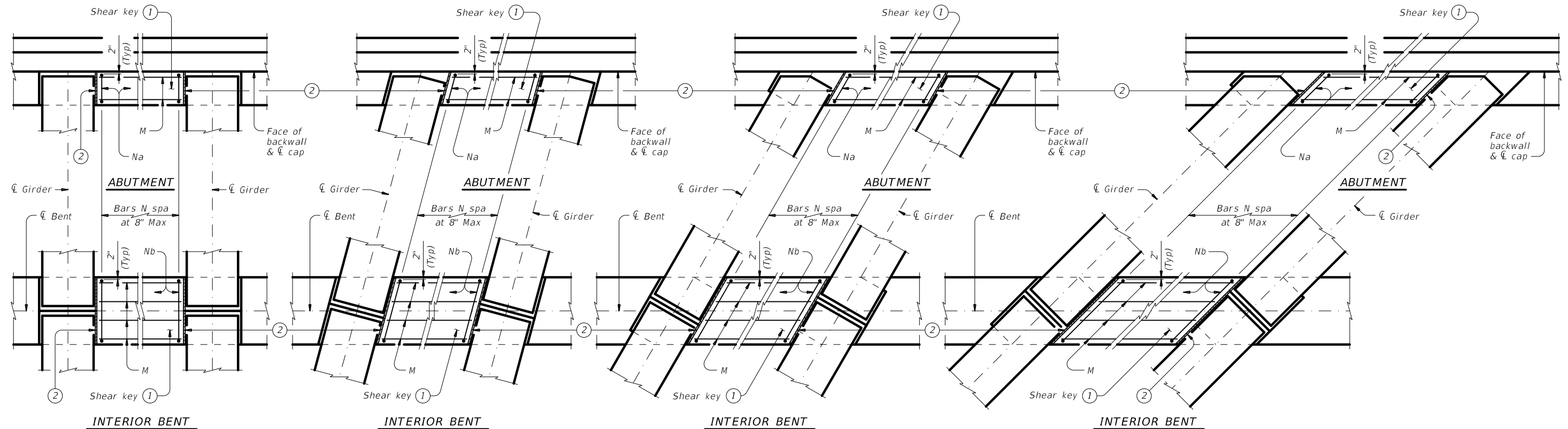
**PRESTRESSED CONCRETE  
I-GIRDER STANDARD  
DESIGNS**  
 24' ROADWAY

**IGSD-24**

FILE: IG-IGSD24-21.dgn	DN: EFC	CK: AJF	DW: EFC	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0923	17	084	CR 392
10-19: Redesigned girders. 1-21: Added load rating.	DIST	COUNTY	SHEET NO.	
	BWD	COMANCHE	59	

12/19/2023 4:01:03 PM  
 DATE: R: 1005000-1005999.1005472.03.04\_DOCUMENTS\DESIGN\ION\_Set\7. Bridge Standards\IG-IGSK-17.dgn  
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**PARTIAL PLANS WITH NO SKEW**

Showing shear keys on 3'-6" wide caps. 4'-0" caps similar.

**PARTIAL PLANS WITH 15° SKEW**

Showing shear keys on 3'-6" wide caps. 4'-0" caps similar.

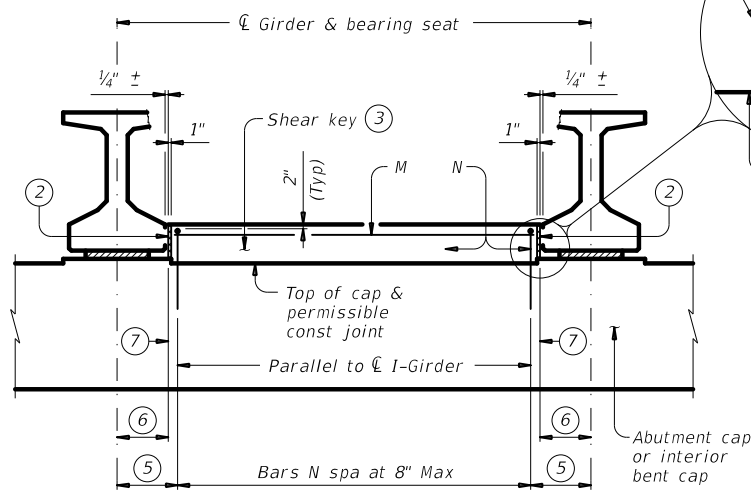
**PARTIAL PLANS WITH 30° SKEW**

Showing shear keys on 3'-6" wide caps. 4'-0" caps similar.

**PARTIAL PLANS WITH 45° SKEW**

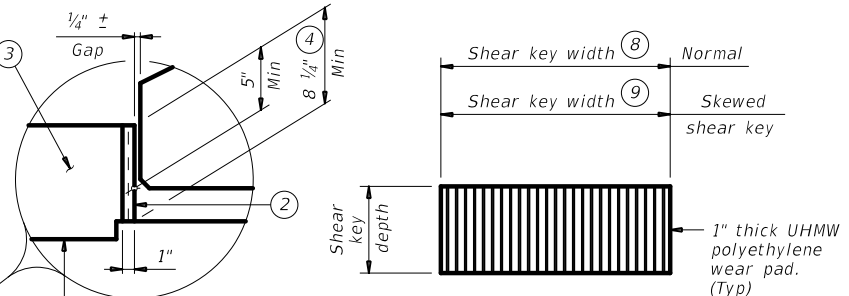
Showing shear keys on 3'-6" wide caps. 4'-0" caps similar.

- ① Place shear keys on the upstream side of structure between outside girder and next adjacent girder, unless shown otherwise on plans.
- ② UHMW polyethylene wear pad. (Typ)
- ③ Leave a 1/4" gap plus or minus between girder and face of wear pad. Cast wear pad with shear key, smooth side facing girder. Care must be taken to keep concrete from flowing under girder. Slope top of shear keys in accordance with Item 420.4.9, "Treatment and Finishing of Horizontal Surfaces."
- ④ Measure at higher bearing seat elevation forward or back. Dimension based on typical bearing pad and bearing seat. Increase as necessary to maintain 5" overlap.
- ⑤ With No Skew = 1'-8 1/4", measured along  $\bar{C}$  cap. With Skew = 1'-8 1/4"  $\div$  Cos Skew, measured along  $\bar{C}$  cap.
- ⑥ With No Skew = 1'-4 1/4", measured along  $\bar{C}$  cap. With Skew = 1'-4 1/4"  $\div$  Cos Skew, measured along  $\bar{C}$  cap.
- ⑦ Face of UHMW polyethylene wear pad. Smooth side of pad facing girder.
- ⑧ Abutments = 1/2 Cap width. Interior bents = Cap width.
- ⑨ Abutments = 1/2 Cap width  $\div$  Cos Skew. Interior bents = Cap width  $\div$  Cos Skew.

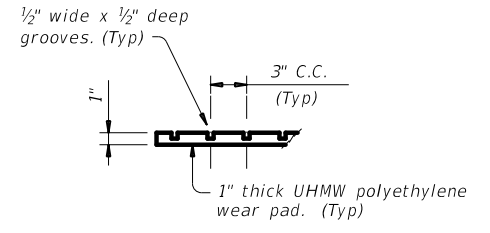


**PARTIAL ELEVATION OF ABUTMENT OR INTERIOR BENT CAP**

Showing shear key with girder Type Tx46. Other I-Girder types similar.

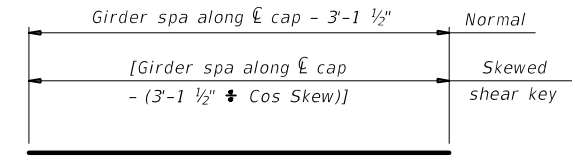


**ELEVATION**

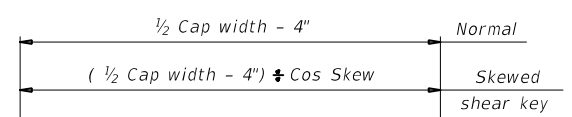


**PART SECTION**

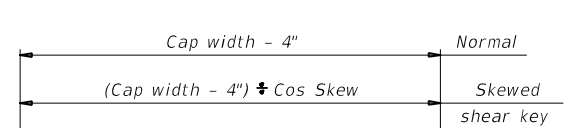
**ULTRA HIGH MOLECULAR WEIGHT (UHMW) POLYETHYLENE WEAR PAD DETAILS**



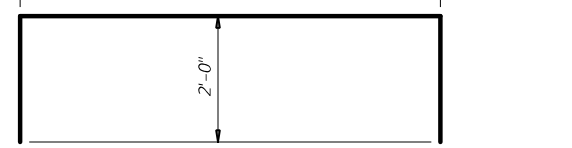
**BARS M (#5)**



**BARS Na (#5) (For abutments)**



**BARS Nb (#5) (For interior bents)**

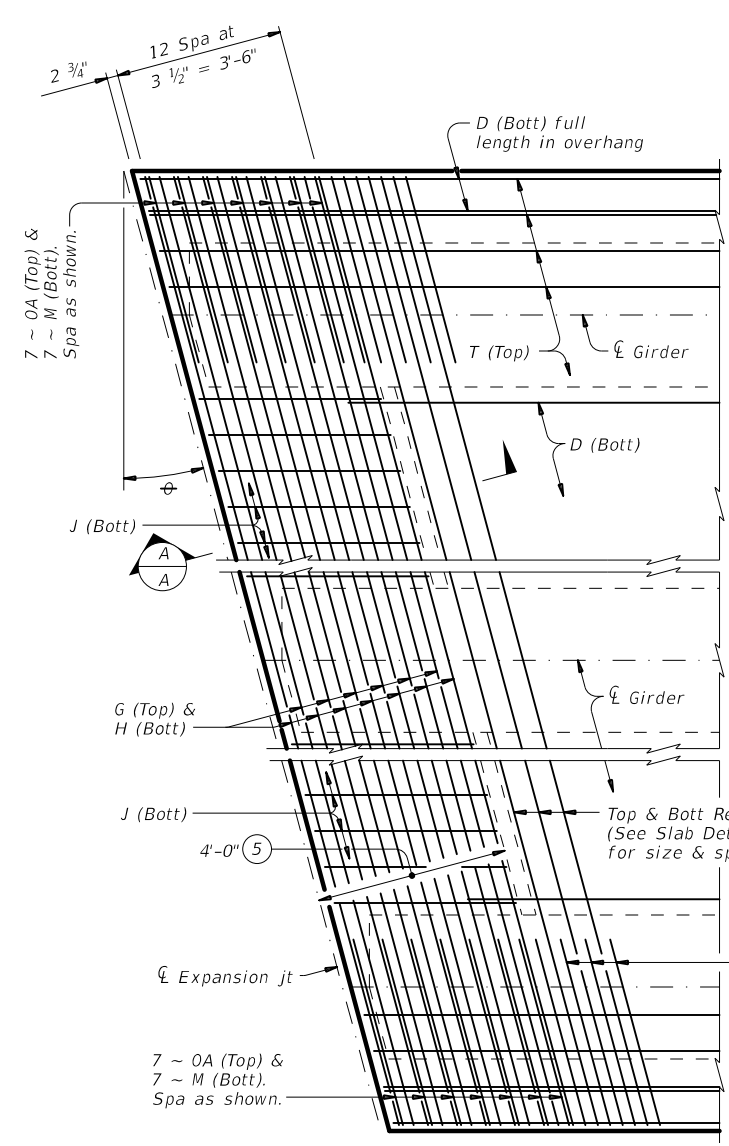


**CONSTRUCTION NOTES:**  
 Provide Class "C" concrete ( $f'_c = 3,600$  psi). Provide Class "C" (HPC) if shown elsewhere on the plans.  
 Provide Grade 60 reinforcing steel.  
 Provide epoxy coated reinforcing steel for shear key if abutment or interior bent reinforcing steel is epoxy coated.  
 Provide Ultra High Molecular Weight (UHMW) polyethylene wear pads in accordance with ASTM D6712.

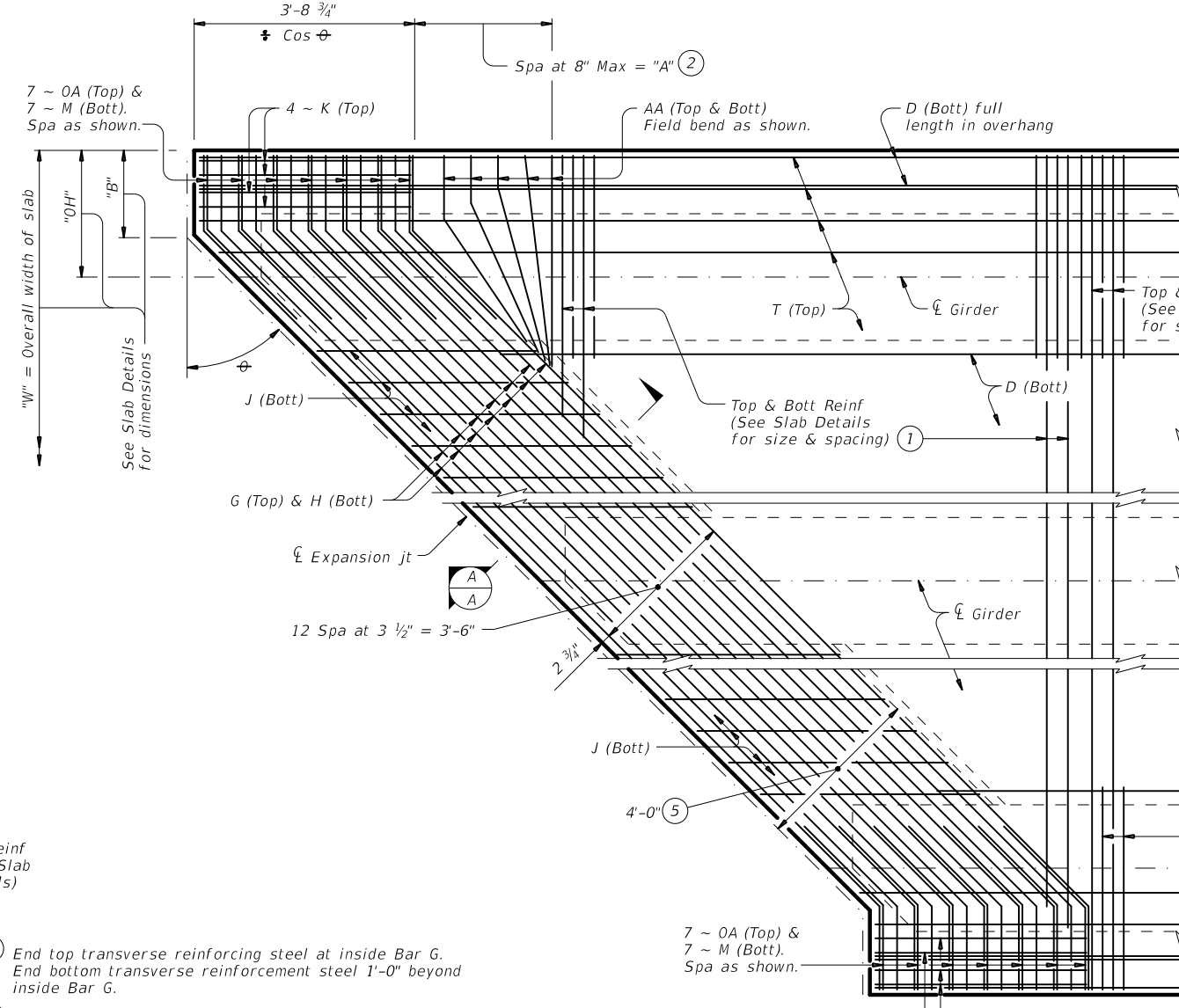
**GENERAL NOTES:**  
 Designed according to AASHTO LRFD Bridge Design Specifications. Details showing skew are drawn showing right forward skew. See Bridge Layout for actual skew direction.  
 These details are limited to bridges skewed 45 degrees and less. This standard is only applicable for I-Girders.  
 Modify details for bearing conditions, and girder spacing not shown on this standard. Details do not account for sole plate or pedestal bearing seat.  
 Include shear key concrete in abutment or bent concrete for payment.  
 UHMW polyethylene wear pads are subsidiary to Class "C" concrete.  
 Cover dimensions are clear dimensions, unless noted otherwise. Reinforcing bar dimensions shown are out-to-out of bar.

		<b>Bridge Division Standard</b>	
<b>SHEAR KEY DETAILS</b> <b>PRESTR CONCRETE I-GIRDERS</b>			
<b>IGSK</b>			
FILE: IG-IGSK-17.dgn	DN: TxDOT	CK: TxDOT	DW: JTR
©TxDOT August 2017	CONT	SECT	JOB
REVISIONS	0923	17	084
	DIST	COUNTY	SHEET NO.
	BWD	COMANCHE	60

12/19/2023 4:01:03 PM  
 DATE: 12/19/2023 4:01:03 PM  
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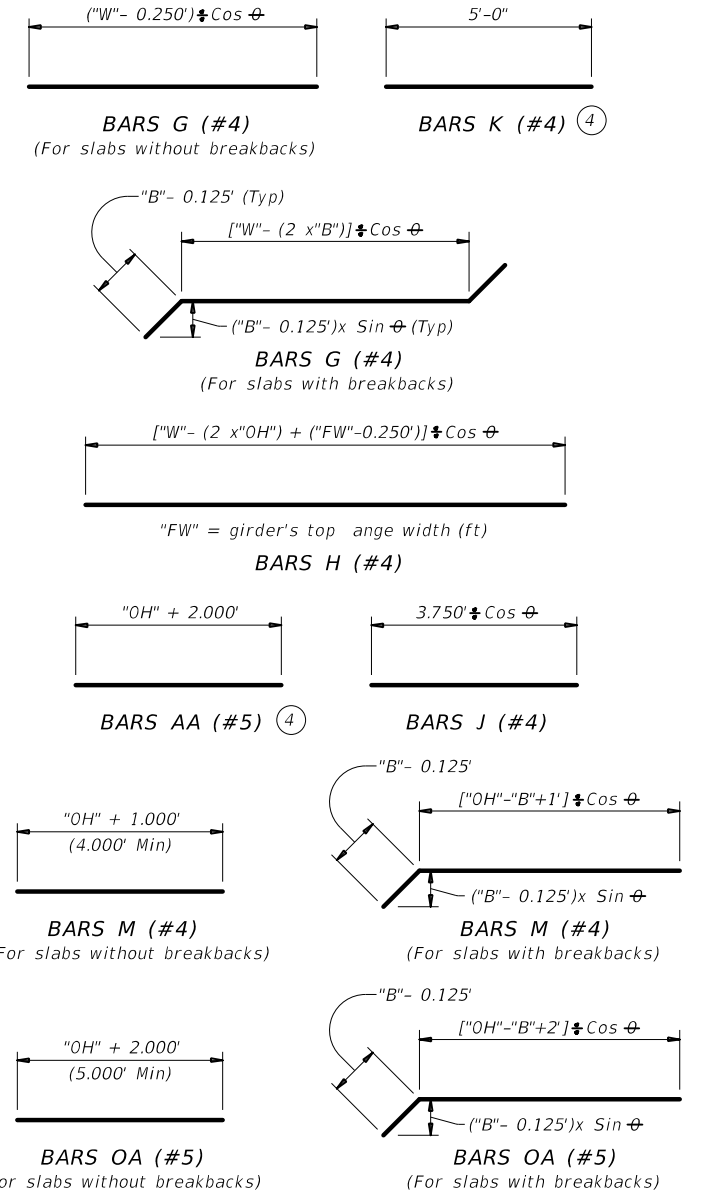


**PARTIAL PLAN FOR SLABS WITHOUT BREAKBACK**



**PARTIAL PLAN FOR SLABS WITH BREAKBACK**

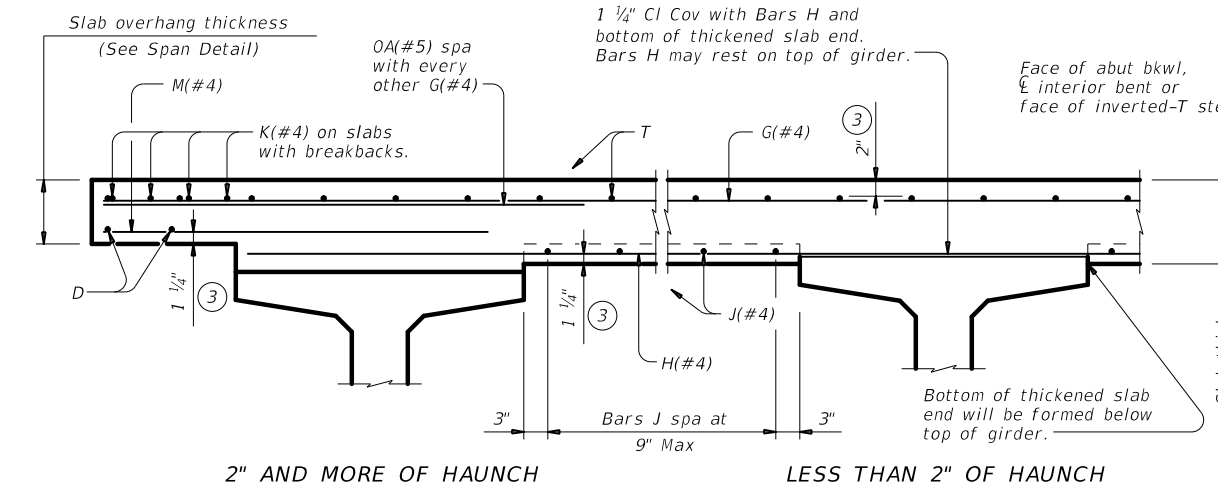
- ① End top transverse reinforcing steel at inside Bar G. End bottom transverse reinforcement steel 1'-0" beyond inside Bar G.
- ②  $A = ("OH" + 2.333 \cdot "B") \times \tan \phi$
- ③ Provide clear cover as indicated unless otherwise shown on Span Details.
- ④ Only required on slabs with breakbacks.
- ⑤ Thickened slab end dimensioned perpendicular to face of bkwl, centerline interior bent or face of inverted-T stem.



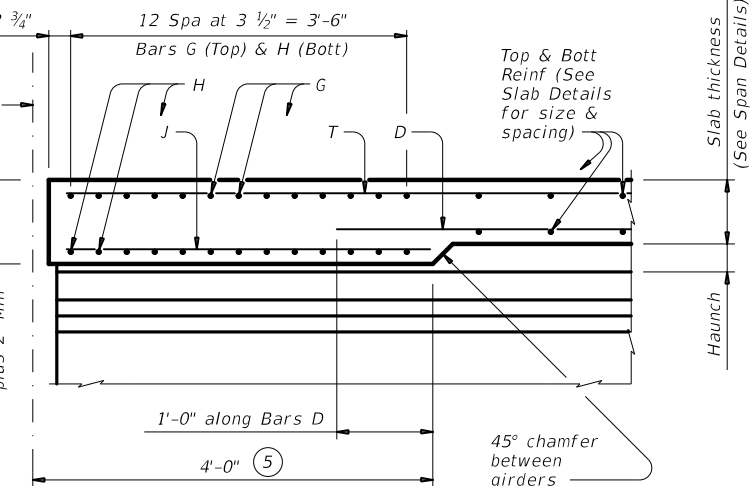
**GENERAL NOTES:**  
 Designed according to AASHTO LRFD Bridge Design Specifications. These details are restricted to Prestressed Concrete I-Girder Spans. These details are to be used in conjunction with the Span Details and PCP standard (if prestressed concrete panels are used). When Option 2 from PCP standard is used, provide Bars AA, G, K and OA in the slab.

**MATERIAL NOTES:**  
 Provide Grade 60 reinforcing steel. If slab reinforcing steel is shown on the Slab Details to be epoxy coated, then Bars AA, G, K, H, J, M and OA must be epoxy coated. Provide bar laps, where required, as follows:  
 Uncoated ~ #4 = 1'-7"  
 Epoxy Coated ~ #4 = 2'-5"

Cover dimensions are clear dimensions, unless noted otherwise.  
 Reinforcing bar dimensions shown are out-to-out of bar.



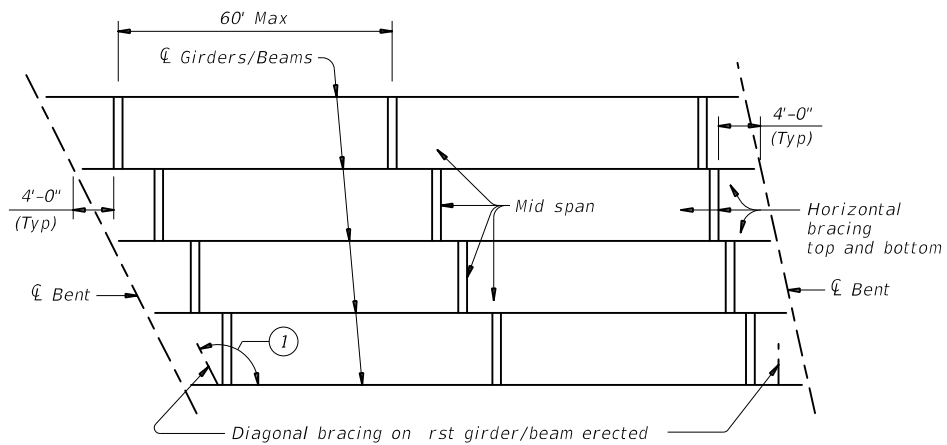
**TYPICAL TRANSVERSE SECTION**  
 (Showing Prestressed Conc I-Girders at  $\perp$  Brg)



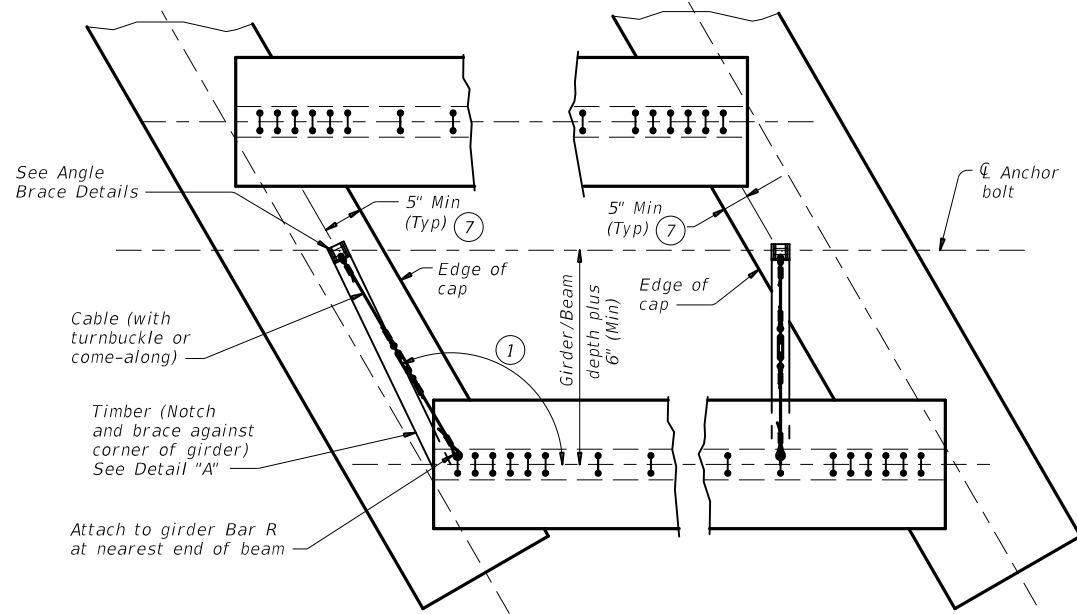
**SECTION A-A**  
 (Showing with 2" and more of haunch)

Texas Department of Transportation		Bridge Division Standard	
<b>THICKENED SLAB END DETAILS</b>			
<b>PRESTRESSED CONCRETE I-GIRDER SPANS</b>			
<b>IGTS</b>			
FILE: IG-IGTS-17.dgn	DN: TxDOT	CK: TxDOT	DW: JTR
©TxDOT August 2017	CONT	SECT	JOB
REVISIONS	0923	17	084
	DIST	COUNTY	SHEET NO.
	BWD	COMANCHE	61

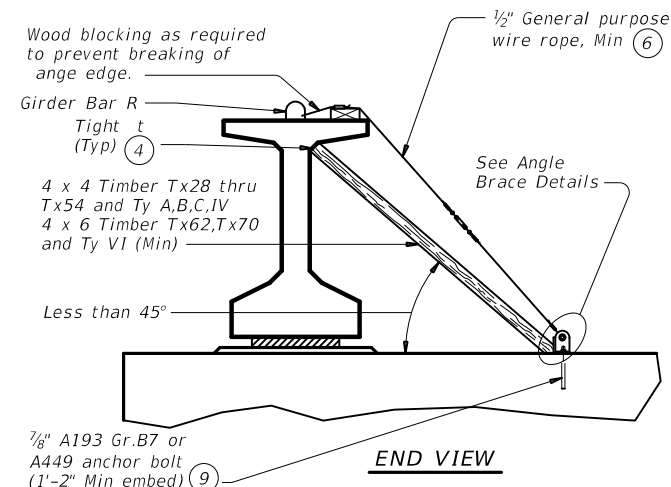
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**ERECTOR BRACING**



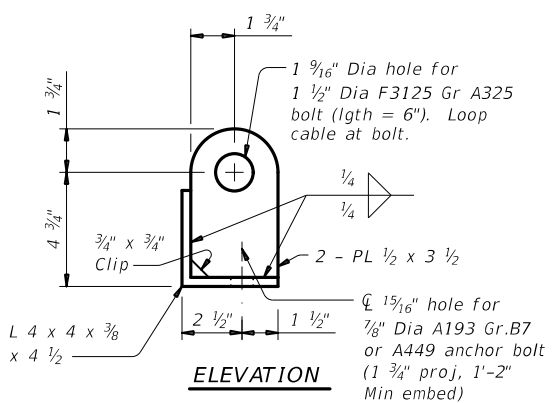
**PLAN**



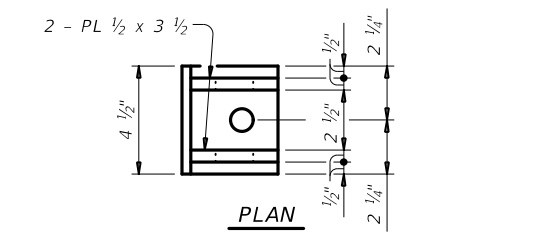
**END VIEW**

**DIAGONAL BRACING DETAILS**

(To be used on both ends of the first girder/beam erected in the span in each phase.)



**ELEVATION**



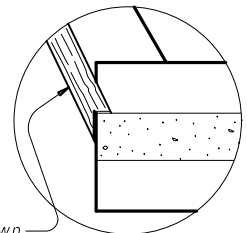
**PLAN**

**ANGLE BRACE DETAILS**

**HAULING & ERECTION:**  
 The Contractor's attention is directed to the possible lateral instability of prestressed concrete girders and beams over 130' long, especially during hauling and erection. The use of the following methods to improve stability is encouraged: Locate lifting devices at the maximum practical distance from girder ends; use external lateral stiffening devices during hauling and erection; lift with vertical lines using two machines; and take care in handling to minimize inertial and impact forces.

**ERECTOR BRACING:**  
 Erection bracing details shown are considered the minimum for full filling the bracing requirements of Item 425. Required erection bracing must be placed immediately after erection of each girder and remain in place until additional bracing as required for slab placement is in place. This standard is needed in all cases to meet requirements for Slab Placement Bracing.

**PHASED CONSTRUCTION:**  
 Place erection and slab placement bracing for all girders in a phase as shown in these details. For phases after first, also place erection and slab placement bracing between outer girder of completed phase and adjacent girder of current phase. When the phase construction joint is between girders, top bracing can be omitted.



**DETAIL "A"**

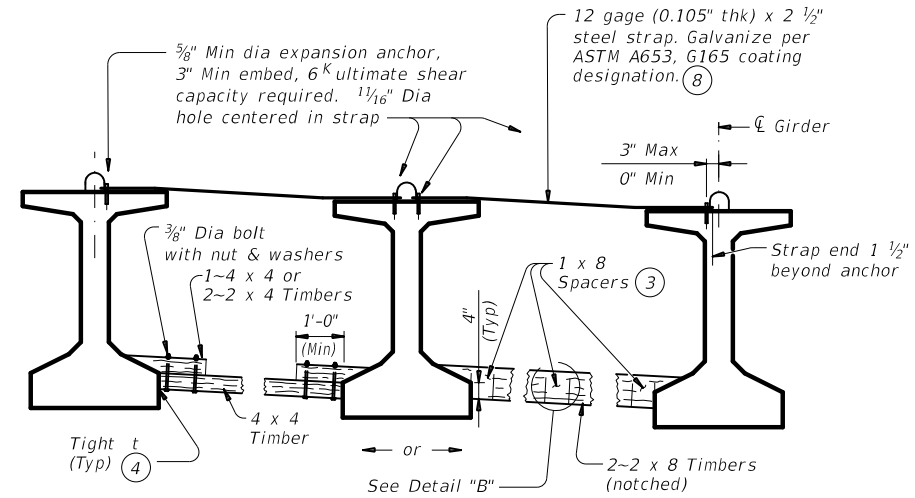
- 1 If angle shown exceeds 120 degrees, move diagonal brace to other side of girder/beam and place square to girder/beam. This may prevent exterior girder from being erected first.
- 2 Place and weld #5 bars as shown during erection. If forming deck with prestressed panels, bars can be temporarily removed, one at a time, during panel erection. Re-install bar prior to additional panel erection. Bars can rest on panels and be bent down and welded to girder Bars R (See Sheet 2 of 2).
- 3 Clear distance between spacers must not exceed 3'. Nail together with 16d nails.
- 4 Use wedges as necessary to obtain tight fit. Nail wedges to timbers.
- 5 Pressure treated landscape timbers can not be used.
- 6 All hardware used with cable must be able to develop a minimum 25 kips breaking strength. Use thimbles at all loops in cable. Install cable clamps with saddles bearing against the live end and U-bolts bearing against the dead end.
- 7 It is acceptable to tie anchor bolts to cap reinforcement.
- 8 Prior to installing, field bend strap to lay flush on both girders' top flange and slope between flange tips.
- 9 Anchor bolt may be drilled and epoxied in place. Provide 25k minimum pullout. Core drill hole.

SHEET 1 OF 2

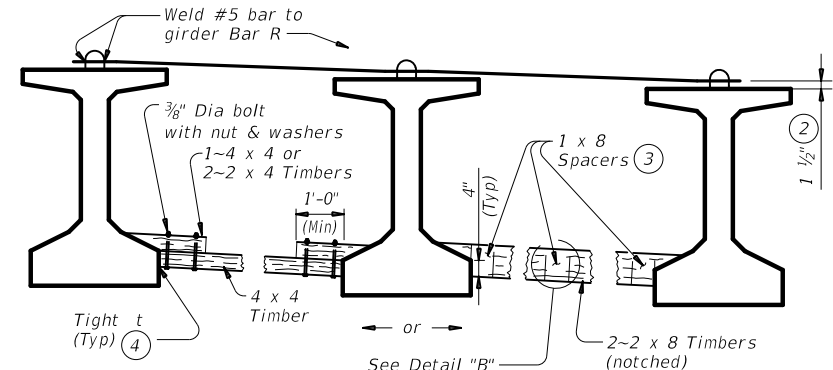
		<b>Bridge Division Standard</b>	
<b>MINIMUM ERECTION AND BRACING REQUIREMENTS</b> <b>PRESTRESSED CONCRETE I-GIRDERS AND I-BEAMS</b> <b>MEBR(C)</b>			
FILE: IG-MEBR(C)-17.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
REVISIONS	0923	17	084
CONTRACT	SECT	JOB	HIGHWAY
BWD	COMANCHE		62

**FOR ERECTOR BRACING, OPTION 1**

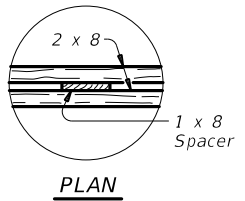
(This option is not allowed when slab is formed with PMDF or plywood.)



**FOR ERECTOR BRACING, OPTION 2**



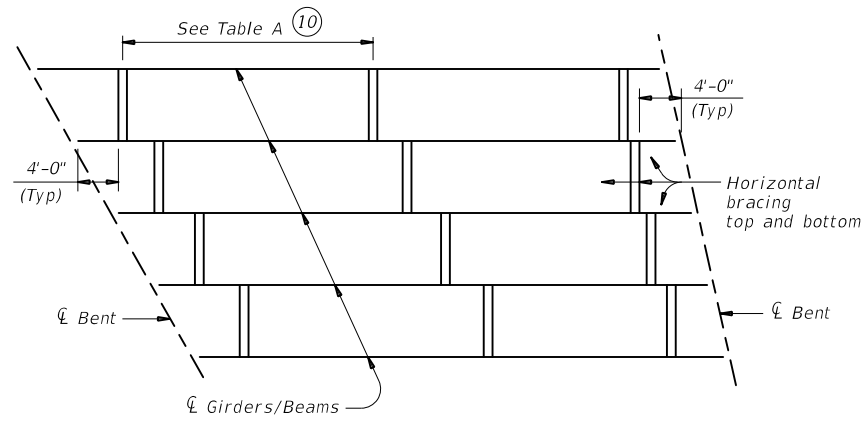
**HORIZONTAL BRACING DETAILS**



**PLAN**

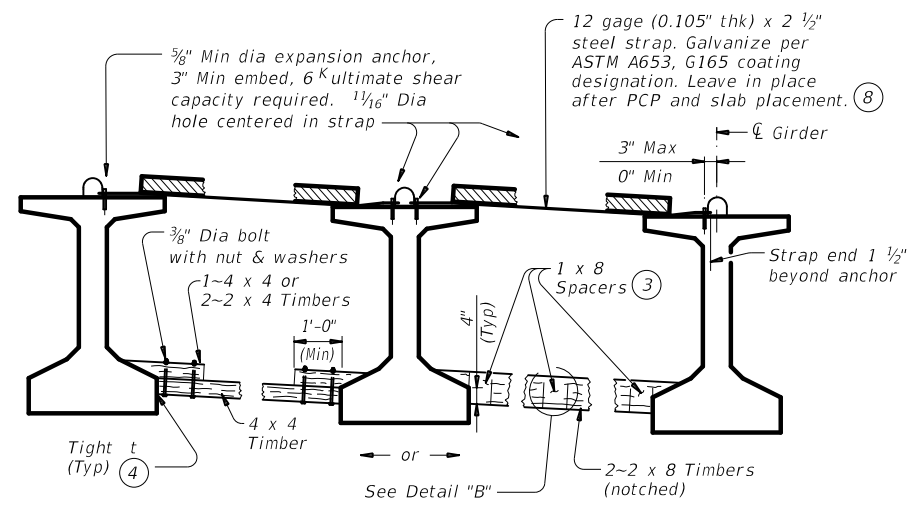
**DETAIL "B"**

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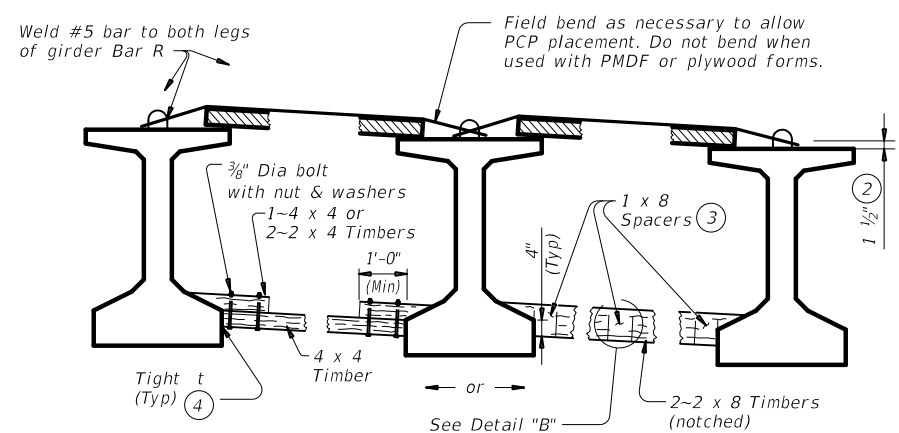
**SLAB PLACEMENT BRACING**

OPTION 1-RIGID BRACING (STEEL STRAP)			OPTION 2-FLEXIBLE BRACING (NO. 5 OVER PCP)		
Girder or Beam Type	Maximum Bracing Spacing		Girder or Beam Type	Maximum Bracing Spacing	
	Slab Overhang less than 4'-0" (11)	Slab Overhang 4'-0" and greater (11)		Slab Overhang less than 4'-0" (11)	Slab Overhang 4'-0" and greater (11)
Tx28	1/4 points	1/4 points	Tx28	1/4 points	1/8 points
Tx34	1/4 points	1/4 points	Tx34	1/4 points	1/8 points
Tx40	1/4 points	1/8 points	Tx40	1/4 points	1/8 points
Tx46	1/4 points	1/8 points	Tx46	1/4 points	1/8 points
Tx54	1/4 points	1/8 points	Tx54	1/4 points	1/8 points
Tx62	1/4 points	1/8 points	Tx62	1/4 points	1/8 points
Tx70	1/4 points	1/8 points	Tx70	1/4 points	1/8 points
A	1/8 points	1/8 points	A	2.0 ft	1.5 ft
B	1/8 points	1/8 points	B	3.0 ft	2.0 ft
C	1/8 points	1/8 points	C	4.5 ft	2.0 ft
IV	1/4 points	1/8 points	IV	1/4 points	4.0 ft
VI	1/4 points	1/8 points	VI	1/4 points	4.0 ft



**FOR SLAB PLACEMENT BRACING, OPTION 1 - RIGID**

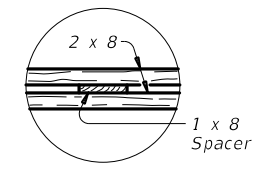
(Showing slab formed with PCP. This option is not allowed when slab is formed with PMDF or plywood.)



**FOR SLAB PLACEMENT BRACING, OPTION 2 - FLEXIBLE**

(Showing slab formed with PCP.)

**HORIZONTAL BRACING DETAILS (5)**



**PLAN  
DETAIL "B"**

- (2) Place and weld #5 bars as shown during erection. If forming deck with prestressed panels, bars can be temporarily removed, one at a time, during panel erection. Re-install bar prior to additional panel erection. Bars can rest on panels and be bent down and welded to girder Bars R.
- (3) Clear distance between spacers must not exceed 3'. Nail together with 16d nails.
- (4) Use wedges as necessary to obtain tight fit. Nail wedges to timbers.
- (5) Pressure treated landscape timbers can not be used.
- (8) Prior to installing, field bend strap to lay flush on both girders' top flange and slope between flange tips.
- (10) Bracing spacing (1/4 and 1/8 points) measured between first and last typical brace location.
- (11) Measure slab overhang from centerline of girder or beam. When overhang varies in span, determine bracing spacing based on largest overhang.

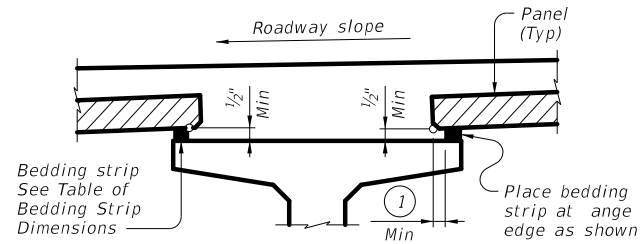
**SLAB PLACEMENT BRACING:**  
 The details for slab placement bracing are considered minimum for fulfilling the requirements of Specification Items 422 and 425. Required slab placement bracing must remain in place until slab concrete has attained a compressive strength of 3000 psi.

**GENERAL NOTES:**  
 Bracing details for spans longer than 150' are not provided. The Contractor must submit proposed bracing details for such conditions to the Engineer for approval prior to erection. Systems equal to or better than those shown may be used provided details of such systems are submitted to and approved by the Engineer prior to erection. Use of these systems or details does not relieve the Contractor of the responsibility for the adequacy of the bracing and the safety of the structure. Removal of bracing for short periods of time to align girders and beams is permissible. All turn-buckles, come-alongs, anchors and other connections must be capable of developing the full strength of the cable shown. Furnish anchor bolts and nuts in accordance with Item 449, "Anchor Bolts".

		<b>Bridge Division Standard</b>	
<b>MINIMUM ERECTION AND BRACING REQUIREMENTS</b> <b>PRESTRESSED CONCRETE I-GIRDERS AND I-BEAMS</b> <b>MEBR(C)</b>			
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REVISIONS			CR 392
DIST: BWD	COUNTY: COMANCHE	SHEET NO:	63

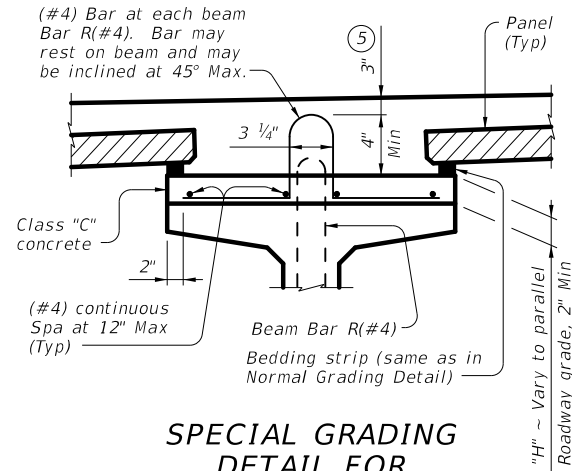
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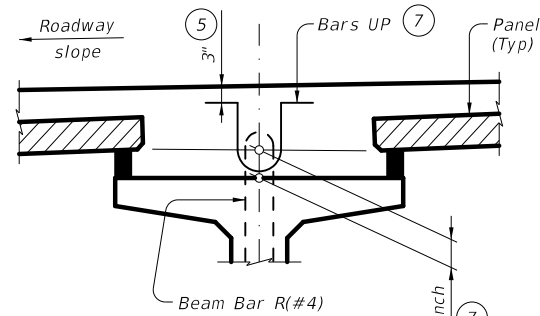
**NORMAL GRADING DETAIL** ③

Showing prestressed concrete I-girders. (Other beam types similar)



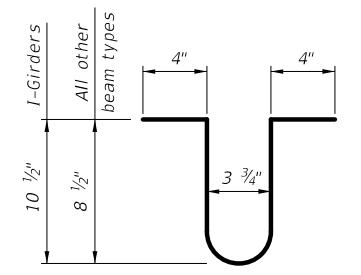
**SPECIAL GRADING DETAIL FOR CONCRETE BEAMS**

Showing prestressed concrete I-girders. (Other beam types similar)

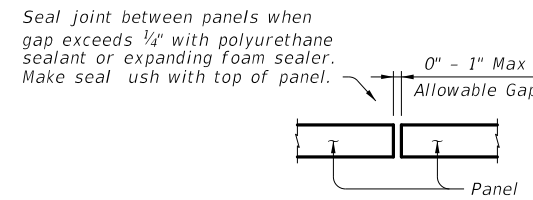


**HAUNCH REINFORCING DETAIL**

Showing prestressed concrete I-girders. (Other beam types similar)

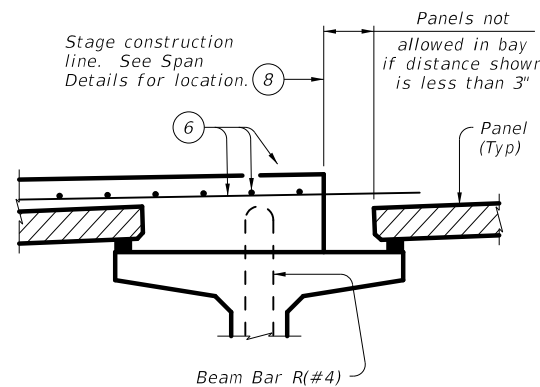


**BARS UP (#4) ⑦**

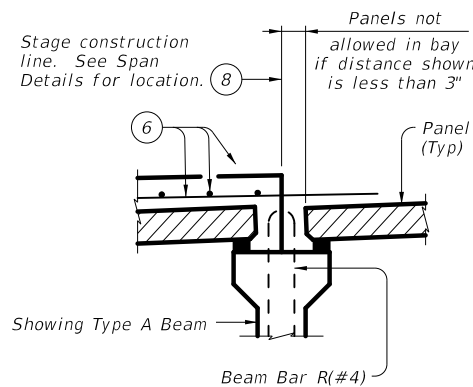


**PANEL JOINTS**

(Panel reinforcing not shown for clarity. The gap cannot be considered as a panel fabrication tolerance. Adjust panel placement to minimize joint openings.)



**PRESTR CONC I-GIRDERS**



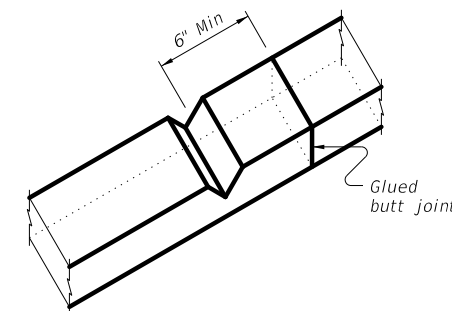
**PRESTR CONC I-BEAMS**

**STAGE CONSTRUCTION LIMITATIONS**

(Other beam types similar)

WIDTH	HEIGHT ④	
	Min	Max
1" (Min)	1/2"	2"
1 1/4"	1/2"	2 1/2"
1 1/2"	1/2"	3"
1 3/4"	1/2"	3 1/2"
2"	1/2"	4"
2 1/4"	1/2"	4 1/2" ②
2 1/2"	1/2"	5" ②
2 3/4"	1/2"	5 1/2" ②
3" (Max)	1/2"	6" ②

- ① 2" Min for I-girders, 1 1/2" Min for all other beam types.
- ② Allowed for prestressed concrete I-girders, not allowed on other beam types.
- ③ To reduce the quantity of cast-in-place concrete, bedding strip thickness may be increased in 1/4" increments. Bedding strips must be comprised of one layer. Bond bedding strips to the beams with an adhesive compatible with bedding strips. Bedding strips over 2.5" high may need to be bonded to panels. The same thickness strip must be used under any one panel edge and the maximum change in thickness between adjacent panels is 1/4". Alternatively, bedding strips may be cut to grade. Panels may be supported by an alternate method, using a commercial product, if approved by the Engineer of Bridge Design, Bridge Division. If bedding strips exceed 6" high for I-girders, 4" high for all other beam types, use Special Grading Detail for Concrete Beams or submit an alternate method to the Bridge Division for approval.
- ④ Height must not exceed twice the width.
- ⑤ Provide clear cover as indicated unless otherwise shown on Span Details.
- ⑥ See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Transverse top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.
- ⑦ Space Bars UP(#4) with Beam Bars R(#4) in all areas where measured haunch exceeds 3 1/2" with I-girders, and 3" for all other beam types. Epoxy coating for Bars UP is not required.
- ⑧ Do not locate construction joints on top of a panel.
- ⑨ Butt adjacent bedding strips together with adhesive. Cut v-notches, approx 1/4" deep, in the top of the bedding strips at 8' o.c..



**BEDDING STRIP DETAIL** ⑨

**CONSTRUCTION NOTES:**

Erected panels must bear uniformly on bedding strips of extruded polystyrene placed along top edge edges. Placing panels to minimize joint openings is recommended. If additional blocking is needed, special grading details for supporting the panels and extra reinforcing between beam and slab will be considered subsidiary to deck construction. Bars U, shown on PCP-FAB, may be bent over or cut off if necessary. Care must be taken to ensure proper cleaning of construction debris and consolidation of concrete material under the edges of the panels. Bedding strips must be placed at beam edge edges so that adequate space is provided for the mortar to flow a minimum of 1 1/2" under the panels as the slab concrete is placed. To allow the proper amount of mortar to flow between beam and panel, the minimum vertical opening must be at least 1/2". Roadway cross-slope reduces the opening available for entry of the mortar. Bedding strips varying in thickness across the beam are therefore required. For clear span between U-beams less than or equal to 18", see Permissible Slab Forming Detail on Miscellaneous Slab Detail sheets, UBMS.

**MATERIAL NOTES:**

Provide Grade 60 reinforcing steel in the cast-in-place slab. See Table of Reinforcing Steel for size and spacing of reinforcement. If the top and bottom layer of reinforcing steel is shown on the Span Details to be epoxy coated, then the D, E, P, & Z bars must be epoxy coated. Provide bar Laps, where required, as follows:  
 Uncoated ~ #4 = 1'-7"  
 Epoxy Coated ~ #4 = 2'-5"

**GENERAL NOTES:**

Designed according to AASHTO LRFD Bridge Design Specifications. Panel placement may follow either Option 1 or Option 2 except Option 1 must be used if the skew exceeds 45 degrees. Use of Prestressed Concrete Panels is not permitted for horizontally curved steel plate or tub girders. See Span Details for other possible restrictions on their use. These details are to be used in conjunction with the Span Details, PCP-FAB and other applicable standard drawings. When panel support (bedding strips) deviates from what is shown herein, provide details signed and sealed by a professional Engineer. Any additional reinforcing or concrete required on this standard is considered subsidiary to the bid item "Reinforced Concrete Slab".

Cover dimensions are clear dimensions, unless noted otherwise.  
 Reinforcing bar dimensions shown are out-to-out of bar.

Texas Department of Transportation Bridge Division Standard

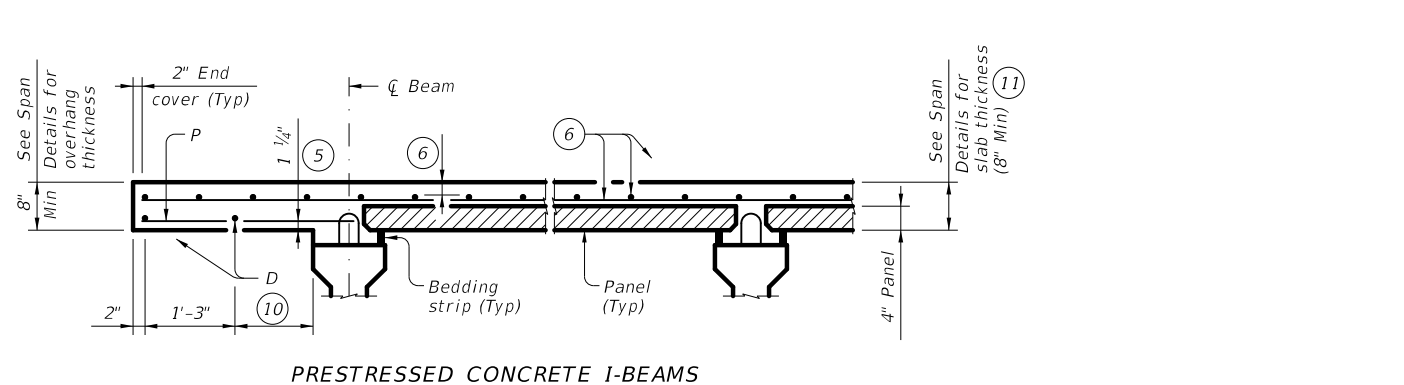
**PRESTRESSED CONCRETE PANELS DECK DETAILS**

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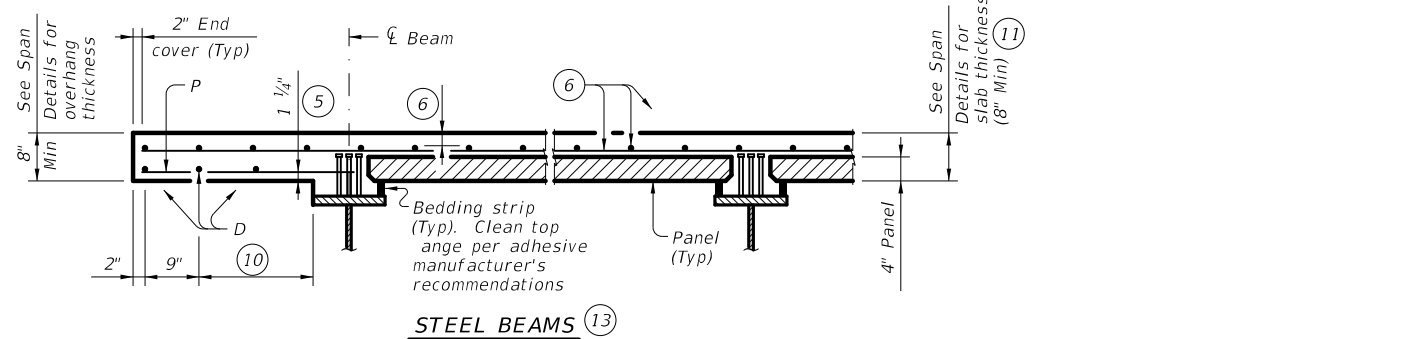
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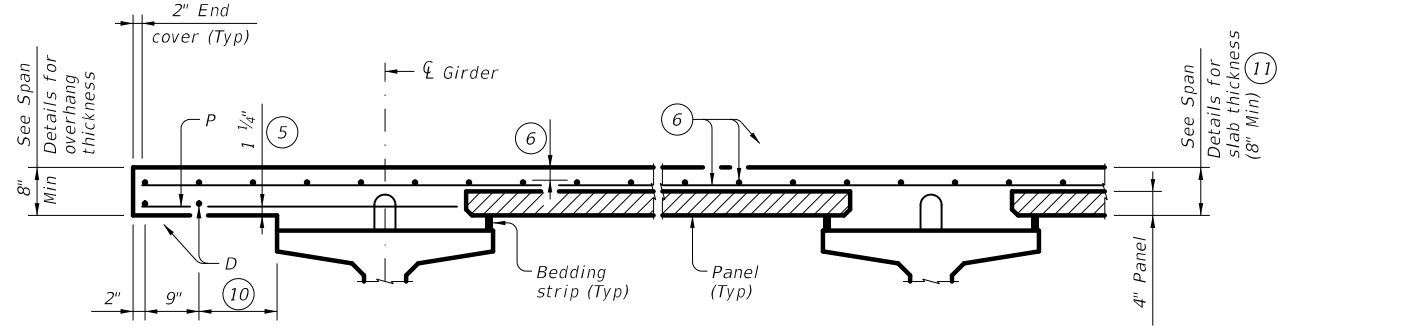
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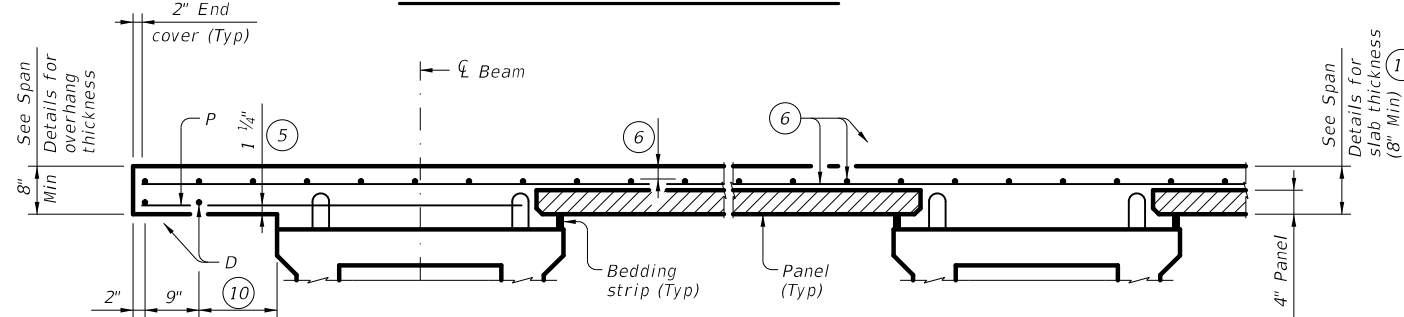
**PRESTRESSED CONCRETE I-BEAMS**



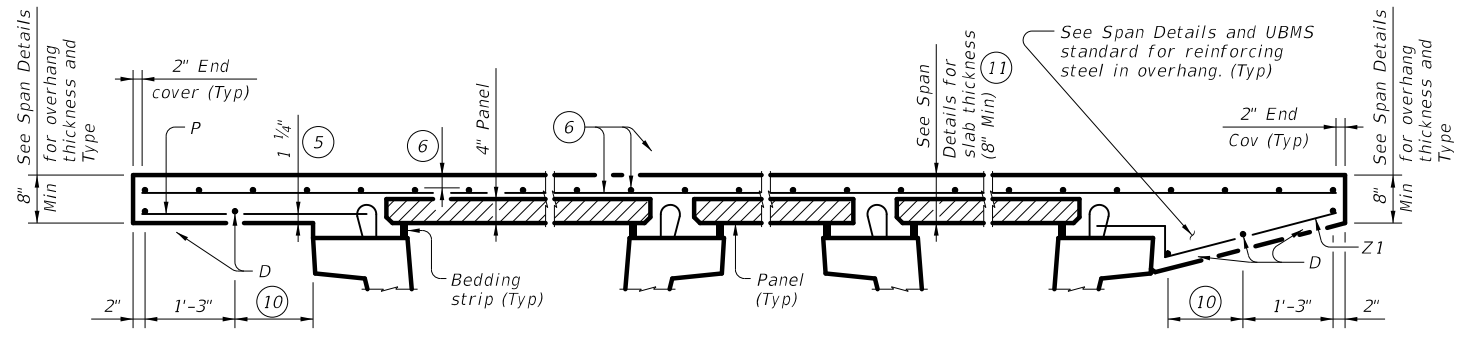
**STEEL BEAMS (13)**



**PRESTRESSED CONCRETE I-GIRDERS**



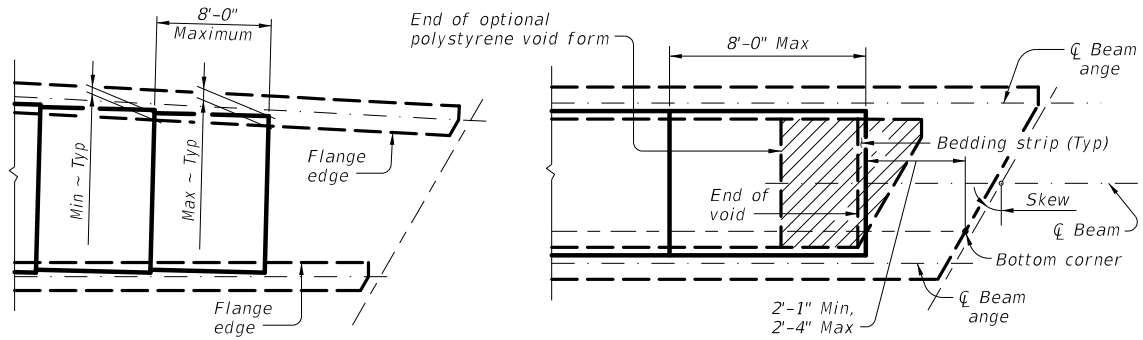
**PRESTRESSED CONCRETE X-BEAMS**



**NORMAL OVERHANG WITH PRESTR CONC U-BEAMS**

**TYPICAL PART TRANSVERSE SECTIONS**

**SLOPED OVERHANG WITH PRESTR CONC U-BEAMS**

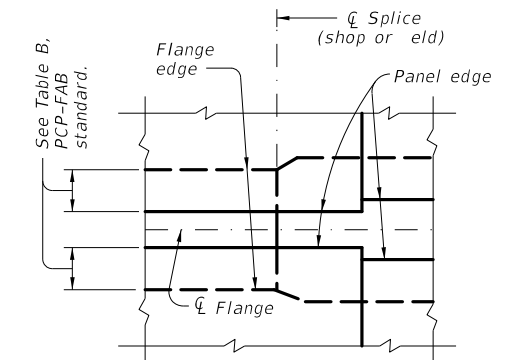


**AT FLARED BEAMS OR GIRDERS**

**OVER CONC U-BEAMS**

**PART PLANS OF PANEL PLACEMENT**

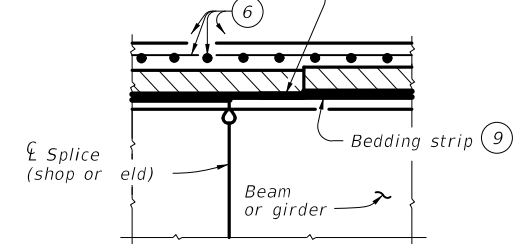
- 5 Provide clear cover as indicated unless otherwise shown on Span Details.
- 6 See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Transverse top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.
- 9 Butt adjacent bedding strips together with adhesive. Cut v-notches, approx 1/4" deep, in the top of the bedding strips at 8' o.c..
- 10 Equally space additional bar if more than 1'-3" Max.
- 11 The actual thickness constructed may exceed the slab thickness shown on the Span Details but the extra thickness may be no more than 2" (1" for prestressed concrete U-beams and steel beams). Bearing seat elevations or nished grade may be adjusted.
- 12 Field adjust Bars Z1(#4) to match actual slope of slab overhangs. Width of slab overhang will vary along span with curved slab edges. Adjust Bar Z1(#4) dimensions to maintain proper cover. Bars Z2(#4) are located at Inverted-Tee stems only.
- 13 Panels are allowed over top tension angles, as approved by the Engineer. See Span Details for additional top mat reinforcement required in tension zones. Location of concrete placement sequence boundaries and bolted eld splices should be considered by the contractor in determining panel limits.



**PLAN AT SPLICE**

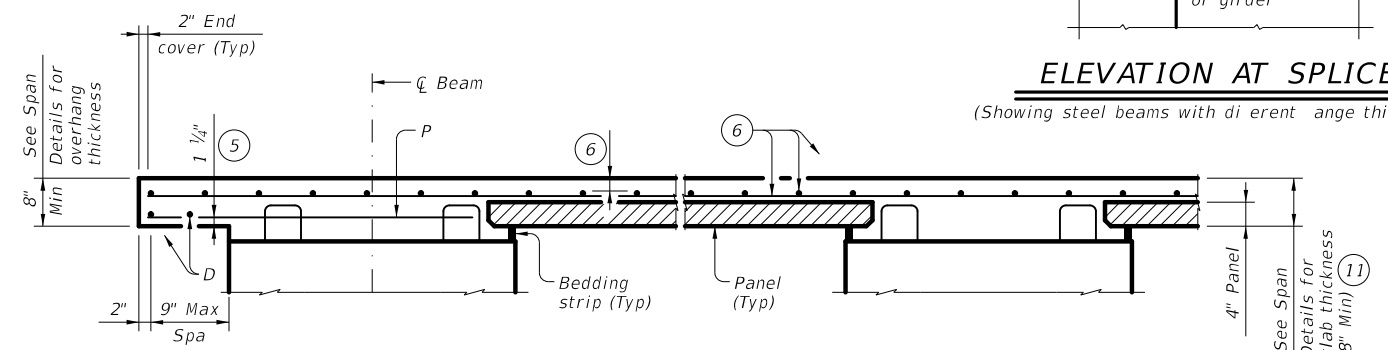
(Showing steel beams with angle width transition)

Cut bedding strip to adjust for difference in angle thickness.



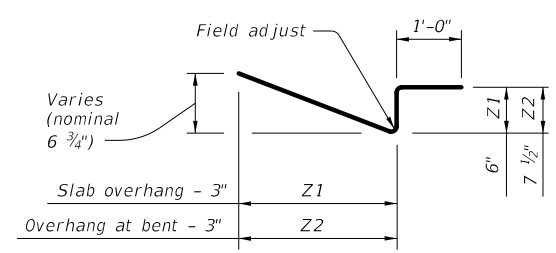
**ELEVATION AT SPLICE**

(Showing steel beams with different angle thickness)



**PRESTRESSED CONCRETE SPREAD SLAB BEAMS**

Bars P over exterior beams are still required when no overhang is used. In this case, only one Bar D, 2" from slab edge, is required.



**BARS Z (#4) (12)**

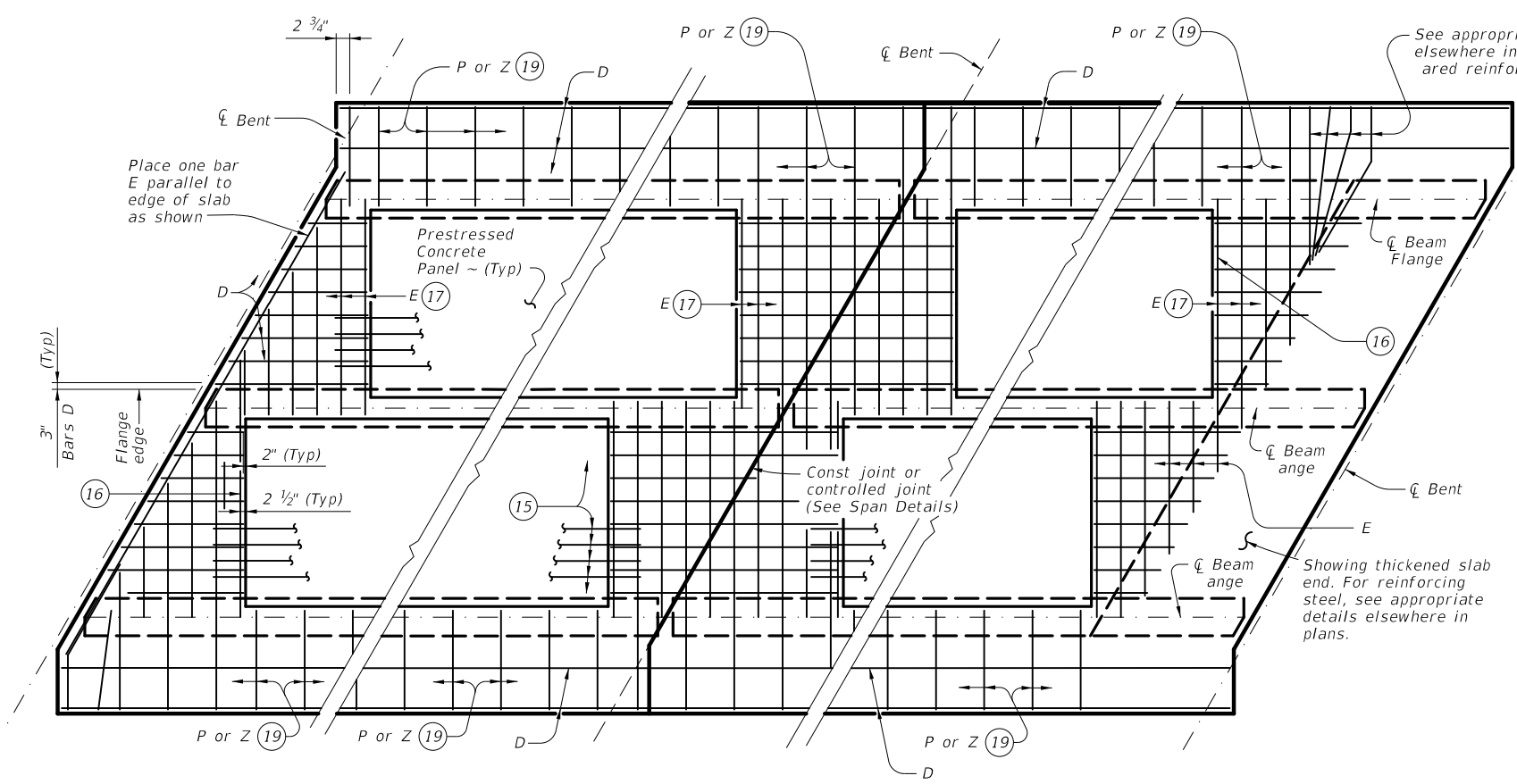


**PRESTRESSED CONCRETE PANELS DECK DETAILS**

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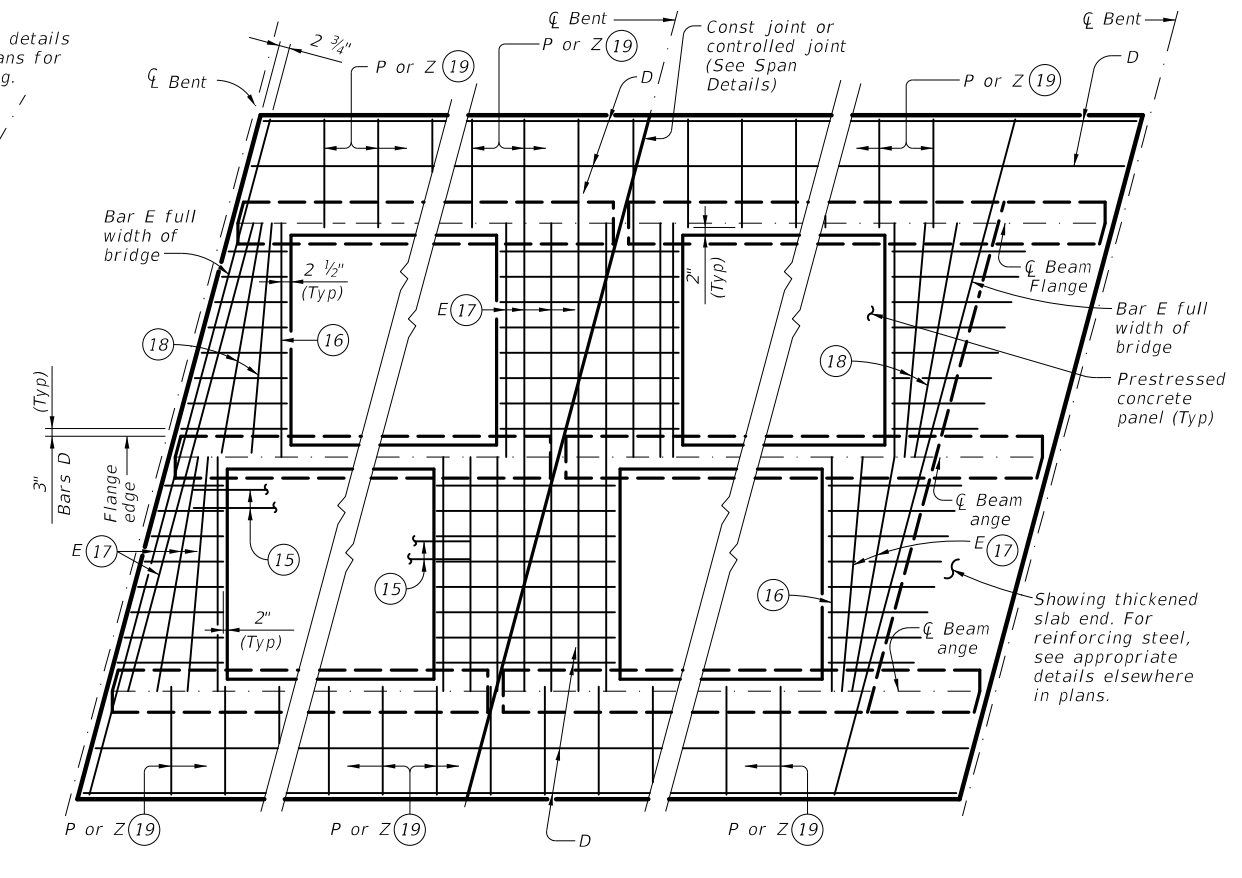
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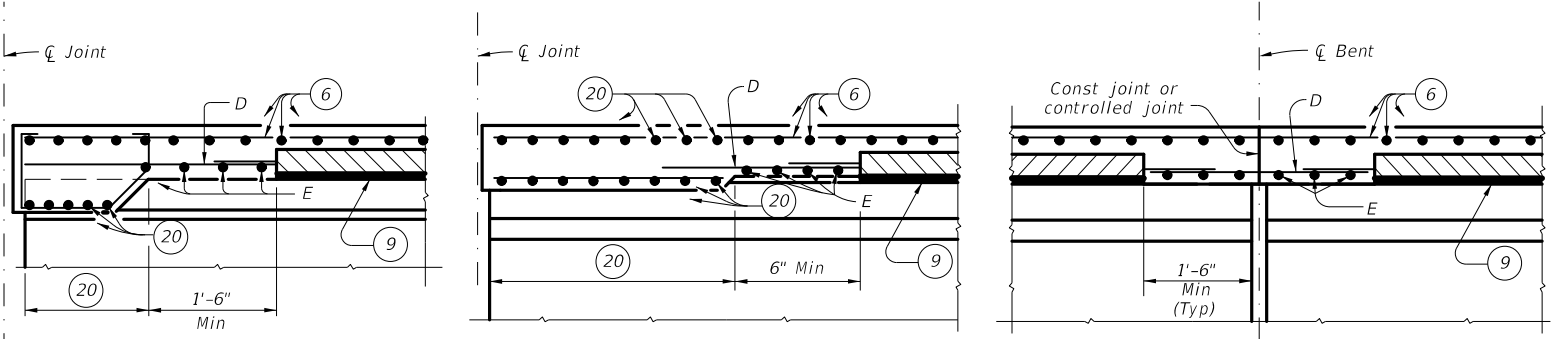
AT ALL SPAN ENDS UNLESS NOTED OTHERWISE  
 AT INTERIOR BENTS  
 AT THICKENED END SLABS

**OPTION 1 ~ PLAN OF SLABS WITH NORMAL REINFORCEMENT**

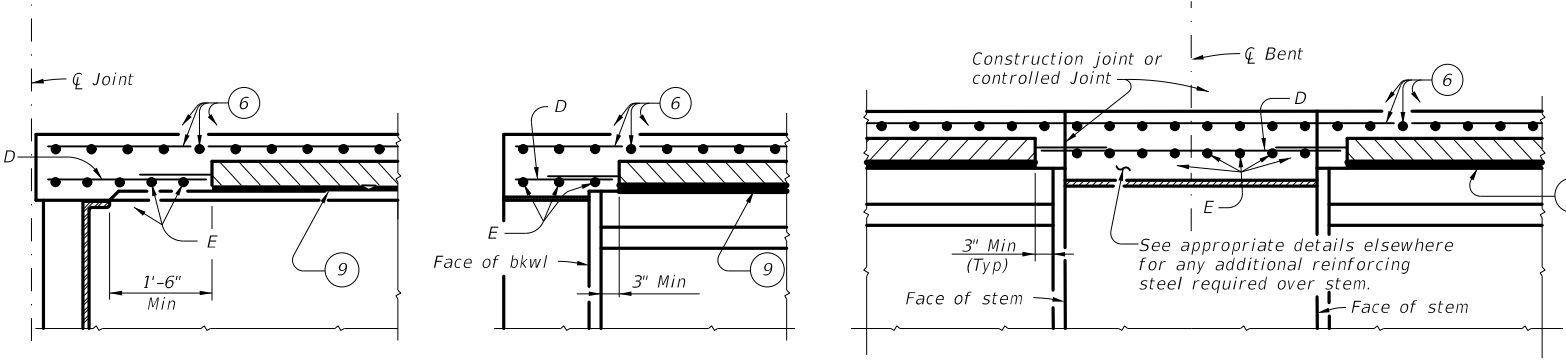


AT ALL SPAN ENDS UNLESS NOTED OTHERWISE  
 AT INTERIOR BENTS  
 AT THICKENED END SLABS

**OPTION 1 ~ PLAN OF SLABS WITH SKEWED REINFORCEMENT**



AT THICKENED SLAB ENDS FOR PRESTR CONCRETE U-BEAMS  
 AT THICKENED SLAB ENDS FOR PRESTR CONCRETE I-BEAMS AND STEEL BEAMS  
 AT SLAB CONTINUOUS OVER CONVENTIONAL INTERIOR BENTS FOR ALL SIMPLE SPAN BEAMS



AT CONVENTIONAL END DIAPHRAGMS FOR STEEL BEAMS  
 AT SLAB OVER ABUTMENT BACKWALL FOR ALL BEAMS  
 AT SLAB CONTINUOUS OVER INVERTED-T BENTS FOR ALL BEAMS

**OPTION 1 ~ ELEVATIONS AT BEAM ENDS**

- 6 See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Transverse top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.
- 9 Butt adjacent bedding strips together with adhesive. Cut v-notches, approx 1/4\"/>
- 14 Max Spacing as listed unless otherwise shown.
- 15 At connection with cast-in-place slab, extend longitudinal panel reinforcement. See PCP-FAB for details.
- 16 Maintain one Bar E(#4) parallel to panel ends (Typ).
- 17 Bars E(#4) not continuous over beam angles must overlap beam angle 6\"/>
- 18 Add skewed Bars E(#4) (Min Spa = 6\", Max Spa = 12\") as required at panel ends.
- 19 Where possible, Bars E(#4) may be extended into overhangs to replace Bars P(#4). Bars Z(#4) are required for sloped overhangs with U-Beams.
- 20 See appropriate thickened slab end details for reinforcing and limits of thickened slab end.

TABLE OF REINFORCING STEEL (14)		
BAR	SIZE	Max Spa (in.)
D	#4	9
E	#4	9
P	#4	18
UP	#4	~
Z	#4	18

HL93 LOADING SHEET 3 OF 4



**PRESTRESSED CONCRETE PANELS DECK DETAILS**

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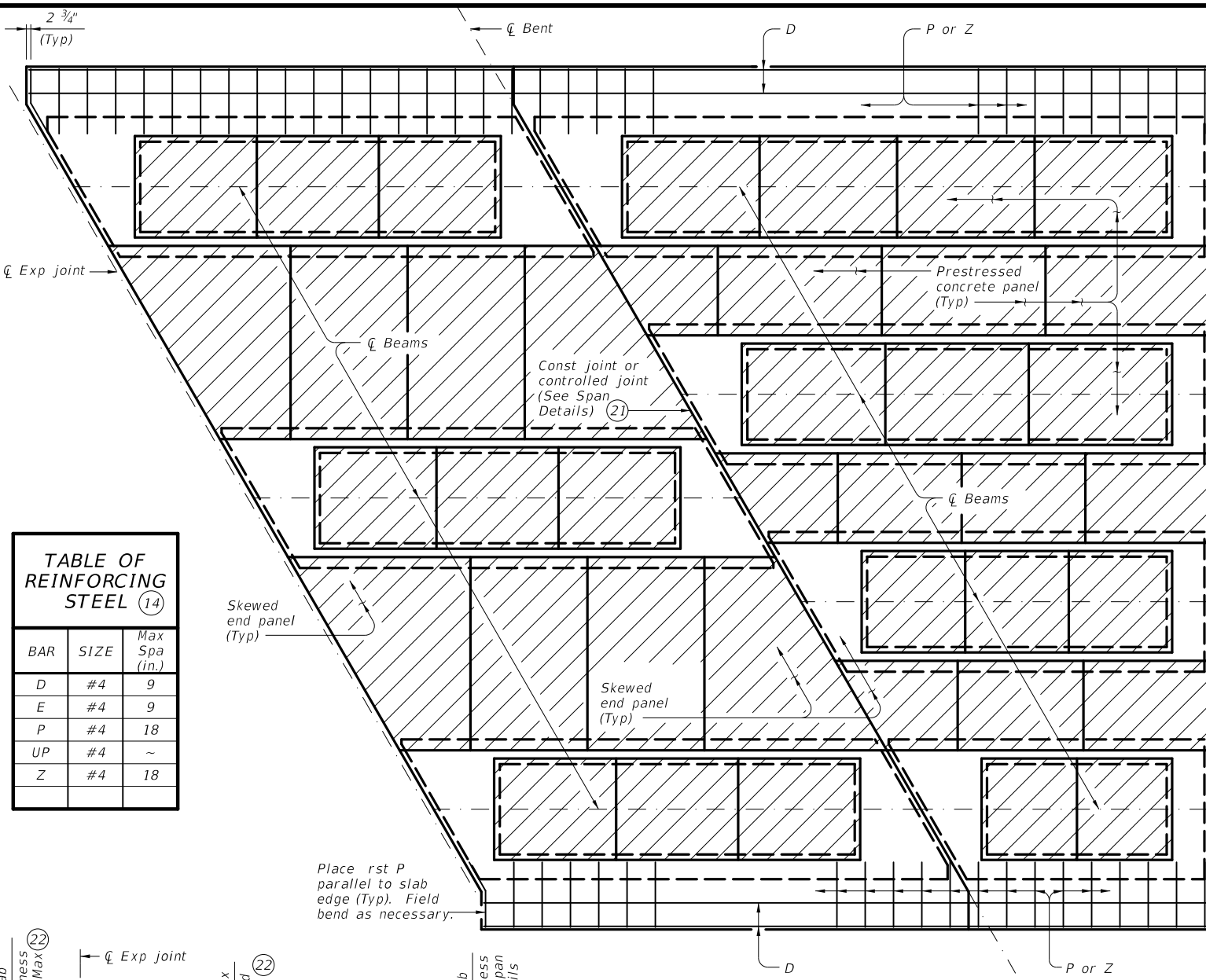
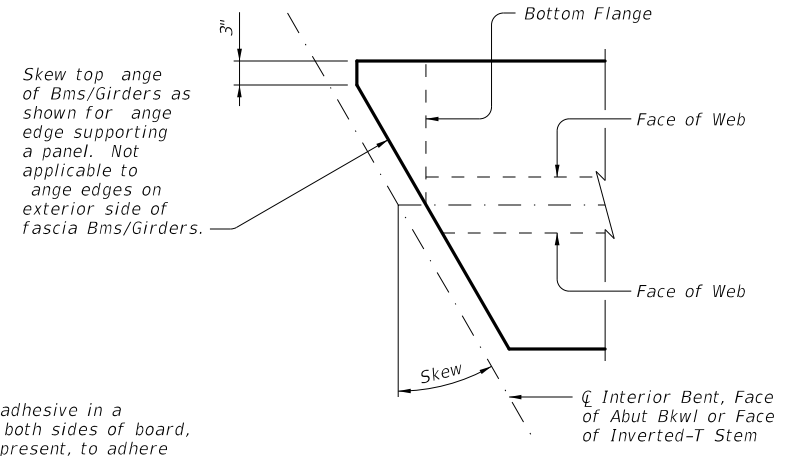
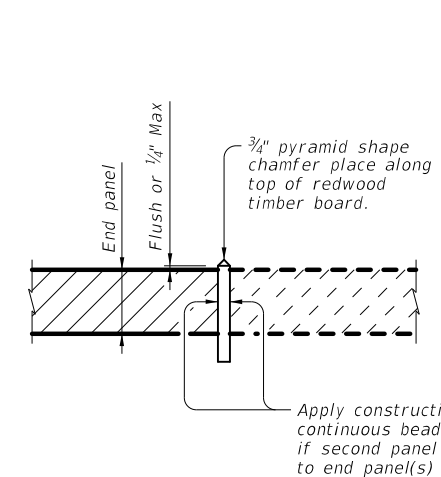


TABLE OF REINFORCING STEEL (14)		
BAR	SIZE	Max Spa (in.)
D	#4	9
E	#4	9
P	#4	18
UP	#4	~
Z	#4	18



**ELEVATION EXAMPLE OF END PANEL AND TIMBER BOARD (23)**

**OPTION 2 ~ SHOWING MODIFICATION TO BEAM/GIRDER TOP FLANGE FOR SKEWS OVER 5°**

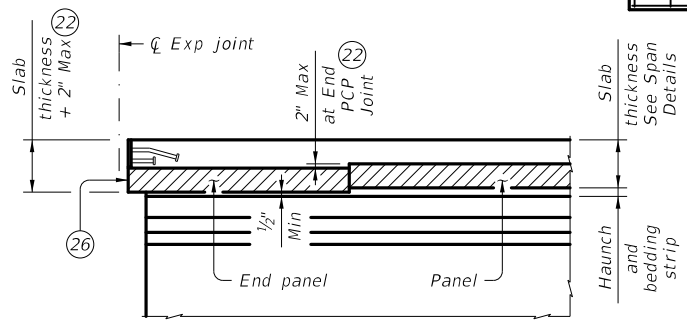
See "Option 2 ~ Elevation At Beam Ends".

Showing I-Beam/I-Girder, U-Beams and Steel Beams similar.

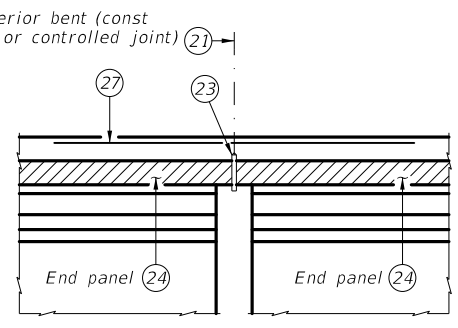
- (6) See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Transverse top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.
- (14) Max Spacing as listed unless otherwise shown.
- (21) 1 1/2" Vinyl or plastic joint former at controlled joints (Stress Cap, Zip Strip, Stress Lock, or equal as approved by the Engineer.)
- (22) End panel may be set up to 2" lower to accommodate expansion joint hardware, provided bedding strip is not less than 1/2" thick.
- (23) 3/4" thick redwood timber board, leave in place. Redwood timber board placed flush with top of panel or within 1/4" Max above panel. Place 3/4" pyramid shape chamfer along top of timber board. Place straight, within 1/2" of centerline of bent or face of inverted-tee, across bridge width and end board at exterior angle edge of fascia beams/girders. Do not extend into overhang.
- (24) Place panel within 1/2" of 3/4" thick board.
- (25) Permanent galvanized steel sheet form. Removable formwork is acceptable.
- (26) Place end panel within 1/2" of expansion joint opening. End panel cannot encroach on required expansion joint opening.
- (27) Place additional (#4) bar 5'-0" in length between every slab Bars T. Center (#4) bar on joint.
- (28) Place additional (#4) bar continuous 2'-6" beyond each side of Inverted-T Stem between every slab bars T.

**SPECIAL OPTION 2 CONSTRUCTION NOTES:**  
 When Option 2 is chosen bottom mat of thickened end slab reinforcing is not required. Use the same top mat as shown on the Thickened Slab End Details sheet.  
 Placing panels adjacent to expansion joints and bent centerlines prior to completing interior panel placement is recommended. Saw cutting panels to t is acceptable when approved by the Engineer. Minimum distance from a saw cut edge to a panel strand is 1 1/2". Do not extend the longitudinal panel reinforcement into the cast-in-place slab.  
 Top angles of beams and girders on skewed bridges must be modified as shown on this drawing. The Contractor is responsible for coordinating this modification with the beam fabricator prior to submitting shop drawings for approval.  
 Fabricator may optionally skew the whole end. When electing to skew whole end, girder end details and bearing type at conventional interior bent must be changed to use condition at abutment. Fabricator must coordinate change in bearing type, bearing centerline location, and dowel location with Engineer and Contractor. Show appropriate changes on girder and bearing shop drawings.  
 Bending of anchor studs of expansion joints shown on standards AJ, SEJ-B, SEJ-M, and SEJ-S(0) is permissible if necessary to clear top of end panels. The Contractor is responsible for coordinating modifications with the joint fabricator. Submit shop drawings for approval when modifications to expansion joint hardware are made.  
 Bedding strips under skewed end panels must conform to the requirements of Item 422 except their minimum compressive strength must be 60 psi.  
 Provide Bars AA, G, K and OA from standard IGTS in the slab.

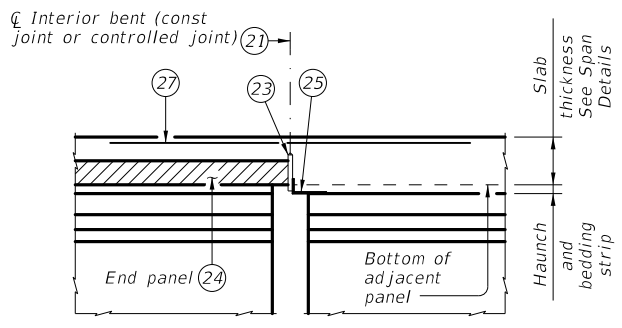
**OPTION 2 ~ PLAN OF SLAB**  
 (Showing U-Beams; other beams similar)



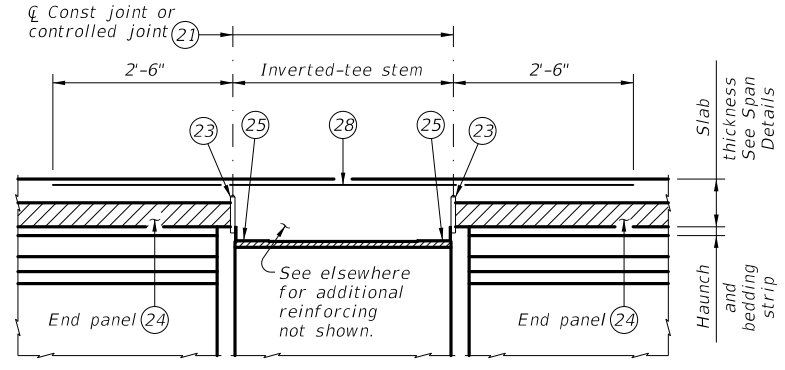
**JOINTS (BETWEEN BEAMS/GIRDERS OR AT INV-T STEM)**  
 For SEJ-B, SEJ-M, SEJ-S(0), AJ, and Type A expansion joints only.



**CONVENTIONAL INTERIOR BENT**  
 Panel against panel between beams/girders.



**CONVENTIONAL INTERIOR BENT**  
 Panel against beam/girder end in adjacent span.



**INVERTED-T BENT**  
 Panels against inverted-tee stem

**OPTION 2 ~ ELEVATIONS AT BEAM ENDS (6)**

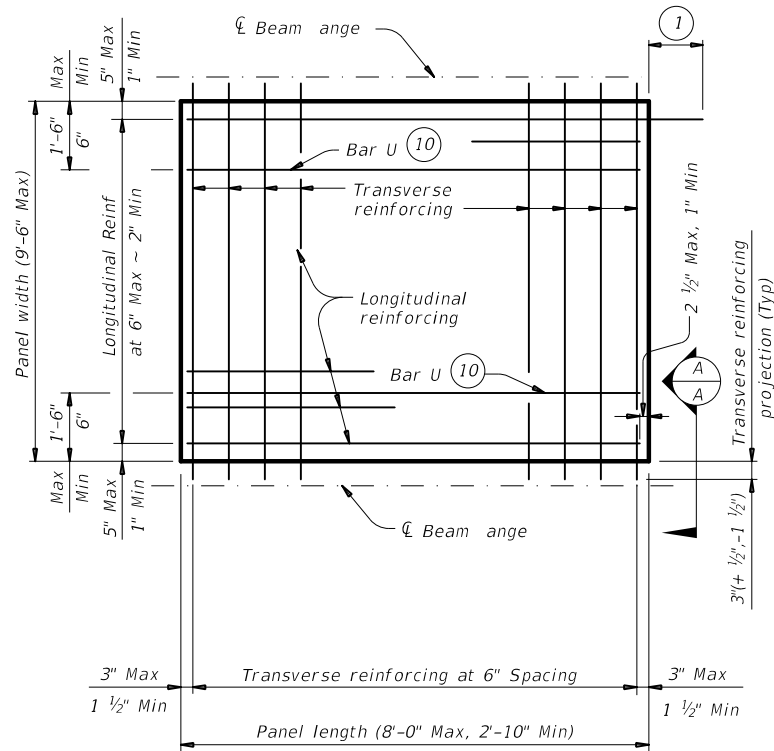


**PRESTRESSED CONCRETE PANELS DECK DETAILS**

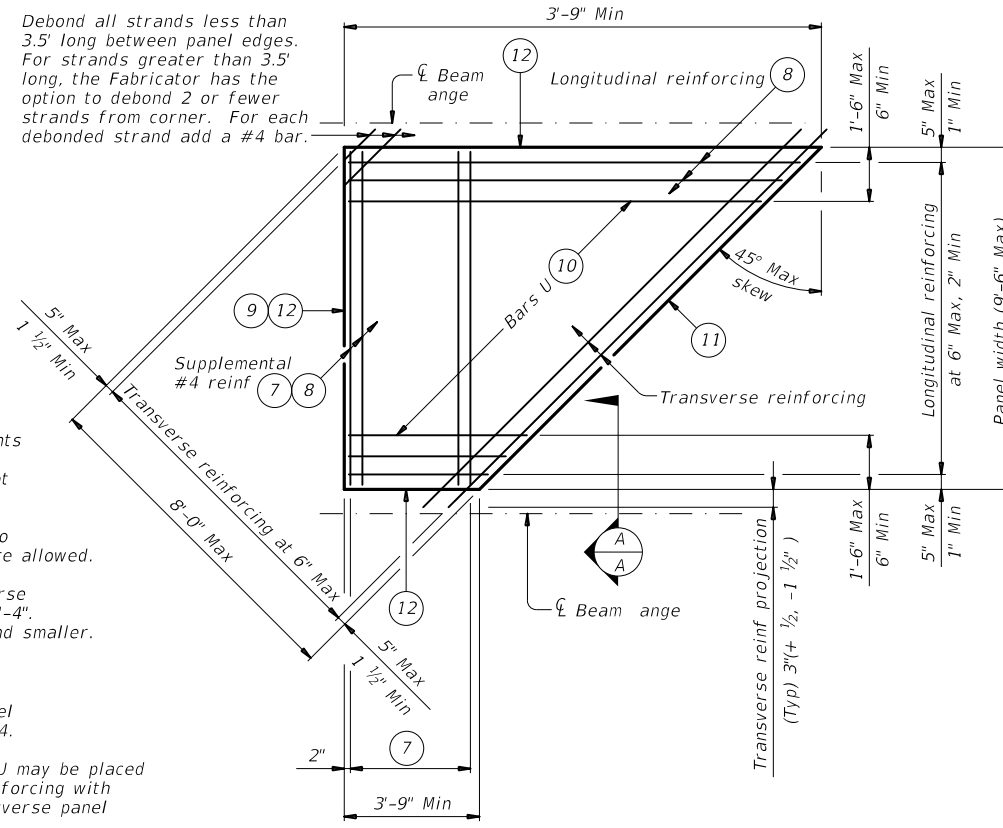
**PCP**

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©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0923	17	084	CR 392
3/2023: Removed top angle tension limit.	DIST	COUNTY	SHEET NO.	
	BWD	COMANCHE	67	

12/19/2023 4:01:09 PM  
 DATE: R:\1005000-1005999\1005472\_03\04\_DOCUMENTS\DESIGN\PCP-FAB-19.dgn  
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**TYPICAL NON-SKEWED PANEL PLAN**



**TYPICAL SKEWED END PANEL PLAN**

(Only to be used with details shown elsewhere in the plans.)

- 1 At connection with cast-in-place slab, extend longitudinal panel reinforcement 1'-0" (+2", -0") past panel end. Alternatively, provide (#3) x 2'-0" dowels at 6" Max Spacing and extend dowels 1'-0" past panel end.
- 2 Four loops required per panel.
- 3 Four loops required per panel. 3/8" or 1/2" strands may be used.
- 4 Normal dimensions must be used on spans with parallel beams. Maximum and Minimum dimensions apply only to spans with arched beams.
- 5 See Normal Grading Detail on PCP standard for lap requirements and bedding strip dimensions. Some laps shown in tables cannot utilize all bedding strip widths.
- 6 One Splice allowed per panel. No more than two sheets of WWR are allowed.
- 7 Provide (#4) bars under transverse reinforcing, 10 Spaces at 4" = 3'-4". Omit for 5 degree (1:12) skew and smaller.
- 8 End Cover 2 1/2" Max, 1" Min.
- 9 Recess strands on indicated panel edge in accordance with Item 424.
- 10 At the fabricator's option, Bars U may be placed parallel to transverse panel reinforcing with horizontal legs in plane of transverse panel reinforcing.
- 11 Use length of indicated panel edge as panel width for purpose of determining type of transverse reinforcing.
- 12 Timber form work permissible this edge.

TABLE A (4) (5)				TABLE B (4) (5)			
Beam Type	Normal (In.)	Min (In.)	Max (In.)	Top Flange Width	Normal (In.)	Min (In.)	Max (In.)
A	3	2 1/2	3 1/2	11" to 12"	2 3/4	2 1/2	2 3/4
B	3	2 1/2	3 1/2	Over 12" to 15"	3 1/4	3	3 1/4
C	4	3	4 1/2	Over 15" to 18"	4	3	4 3/4
IV	6	4	7 1/2	Over 18"	5	3 1/2	6 1/4
VI	6 1/2	4 1/2	8 1/2				
U40 - 54	5 1/2	5 1/2	7				
Tx28-70	6	5	7 1/2				
XB20 - 40	4	3	4 1/2				
XSB12 - 15	4	3	4 1/2				

**GENERAL NOTES:**

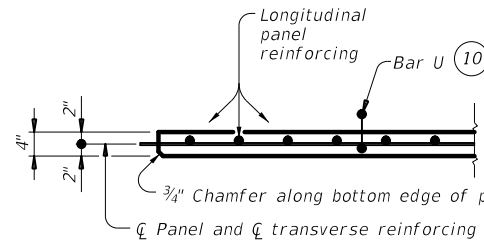
Provide Class H concrete for panels. Release strength  $f'c=3,500$  psi. Minimum 28 day strength  $f'c=5,000$  psi.  
 Provide 3/4" chamfer along bottom edge of panel on beam side. Do not use epoxy-coated reinforcing steel bar or strand in panels. Remove laitance from top panel surface. Finish top of panel to a roughness between a No. 6 and No. 9 concrete surface profile, inclusive, as specified by the International Concrete Repair Institute (ICRI).  
 Shop drawings for the fabrication of panels will not require the Engineer's approval if fabrication is in accordance with the details shown on this standard.  
 A panel layout which identifies location of each panel must be developed by the Fabricator. Permanently mark each panel in accordance with the panel layout. A copy of the layout is to be provided to the Engineer.

**TRANSVERSE PANEL REINFORCEMENT:**

For panel widths over 5', use 3/8" or 1/2" Dia (270k) prestressing strands with a tension of 14.4 kips per strand.  
 For panel widths over 3'-6" up to and including 5', use 3/8" or 1/2" Dia (270k) prestressing strands with a tension of 14.4 kip per strand. Optionally, (#4) Grade 60 reinforcing bars may be used in lieu of prestressed strands.  
 For panel widths up to 3'-6", use (#4) Grade 60 reinforcing bars (prestressed strands alone are not allowed).  
 Place transverse panel reinforcement at panel centroid and space at 6" Max.

**LONGITUDINAL PANEL REINFORCEMENT:**

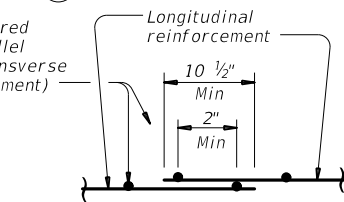
Any of the following options may be used for longitudinal panel reinforcement:  
 1. (#3) Grade 60 reinforcing steel at 6" Max Spacing. No splices allowed.  
 2. 3/8" Dia prestressing strands at 4 1/2" Max Spacing (unstressed). No splices allowed.  
 3. 1/2" Dia prestressing strands at 6" Max Spacing (unstressed). No splices allowed.  
 4. Deformed Welded Wire Reinforcement (WWR) (ASTM A1064) providing 0.22 sq in per foot of panel width. Wires larger than D11 not permitted. Provide transverse wires to ensure proper handling of reinforcing. One splice per panel is allowed. See WWR Splice Detail.  
 No combination of longitudinal reinforcement options in a panel is allowed. Place longitudinal panel reinforcement above or below transverse panel reinforcement. Must be placed above transverse panel reinforcement for skewed end panels with supplemental (#4) reinforcement.



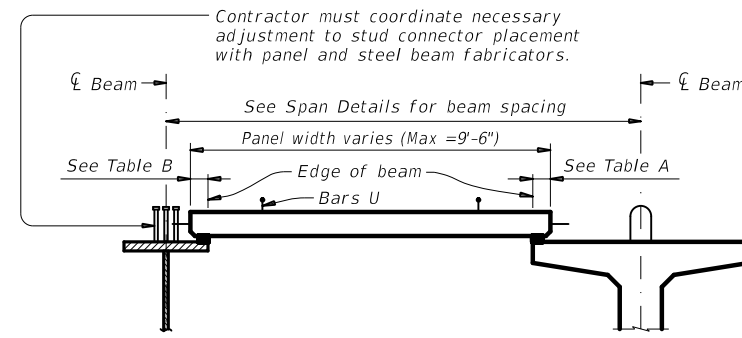
**SECTION A-A**

(Not showing supplemental #4 bars for skewed end panels.)

No splice required for wires parallel to strands (transverse panel reinforcement)

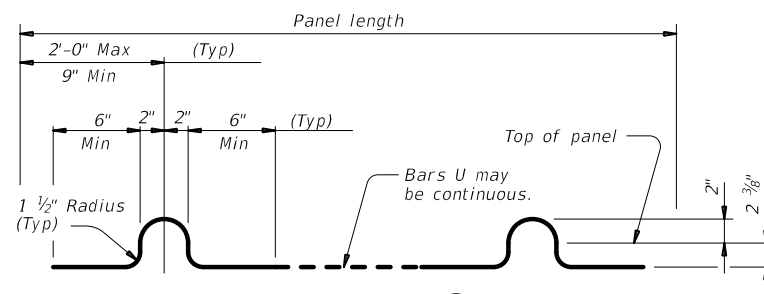


**WELDED WIRE REINFORCEMENT (WWR) SPLICE DETAIL**

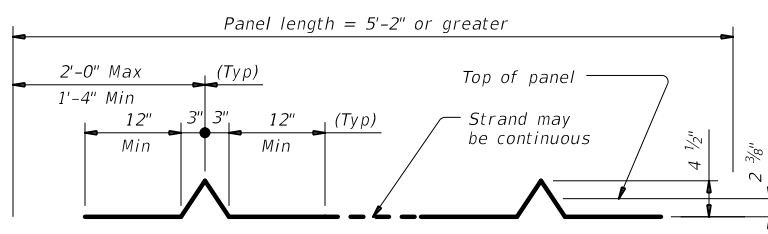


**STEEL BEAMS**

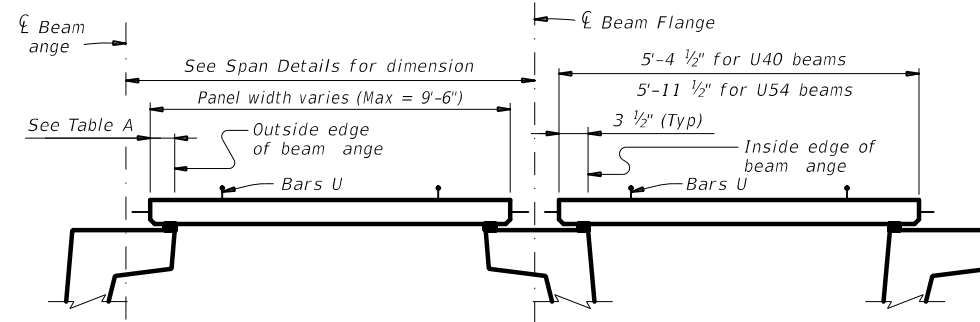
**PRESTRESSED CONCRETE BEAMS OR GIRDERS**  
Typ unless noted otherwise



**BARS U (#3)**



**OPTIONAL STRAND FOR BARS U**



**PRESTRESSED CONCRETE U-BEAMS**

**TYPICAL SECTIONS FOR DETERMINING PANEL WIDTH**

HL93 LOADING



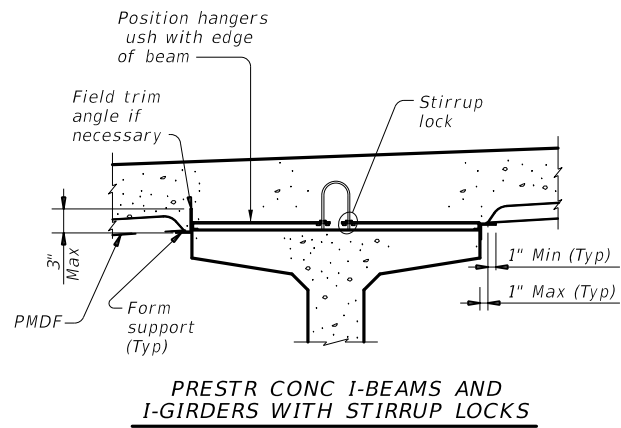
**PRESTRESSED CONCRETE PANEL FABRICATION DETAILS**

PCP-FAB

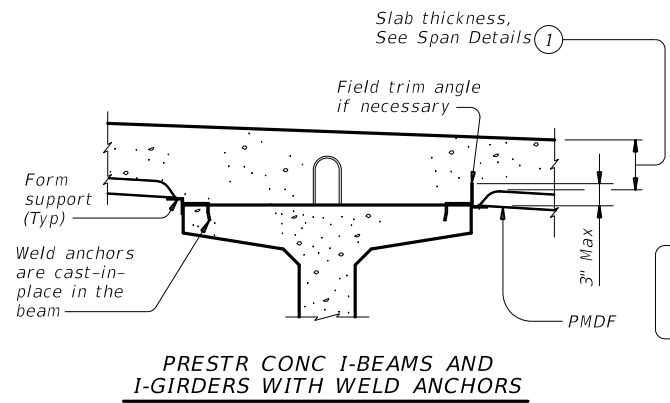
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REVISIONS	0923	17	084	CR 392
DIST	COUNTY	SHEET NO.		
BWD	COMANCHE	68		

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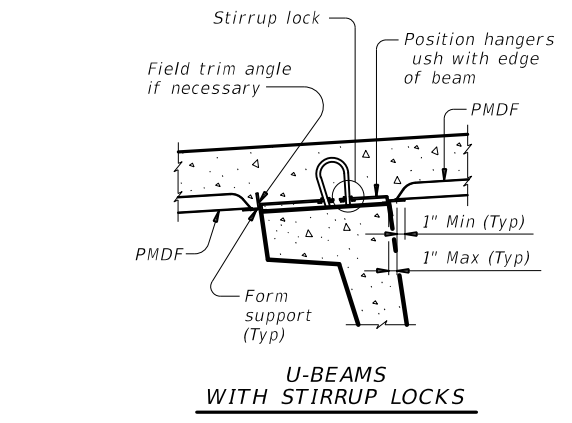
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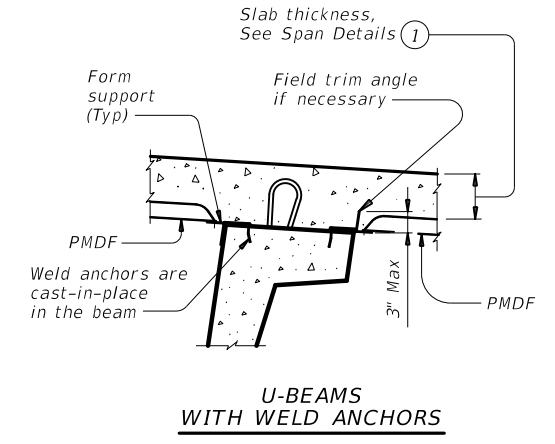
**PRESTR CONC I-BEAMS AND I-GIRDERS WITH STIRRUP LOCKS**



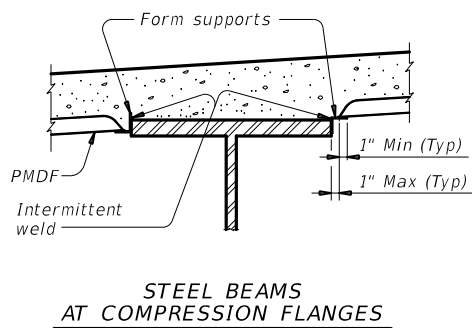
**PRESTR CONC I-BEAMS AND I-GIRDERS WITH WELD ANCHORS**



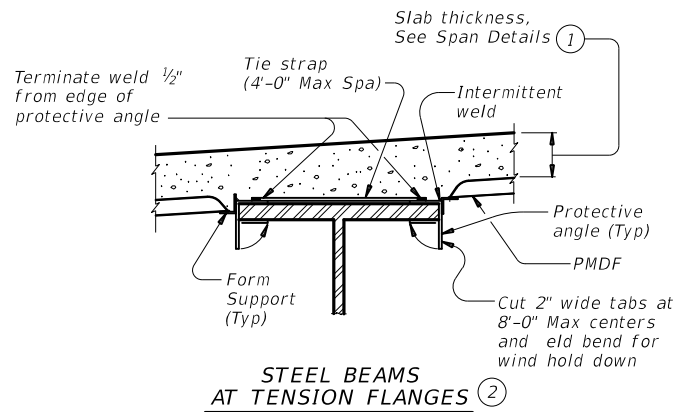
**U-BEAMS WITH STIRRUP LOCKS**



**U-BEAMS WITH WELD ANCHORS**

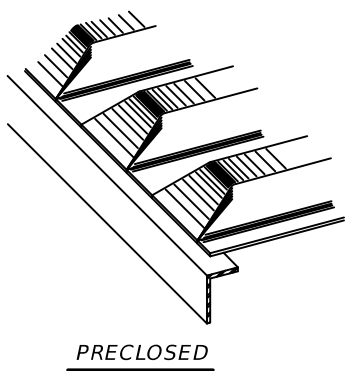


**STEEL BEAMS AT COMPRESSION FLANGES**

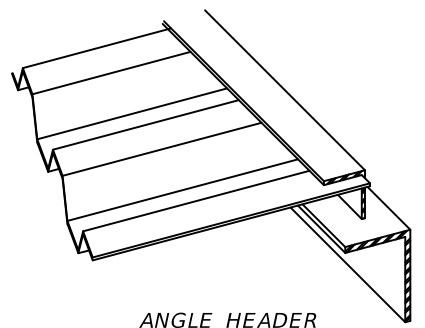


**STEEL BEAMS AT TENSION FLANGES**

**TYPICAL TRANSVERSE SECTIONS**



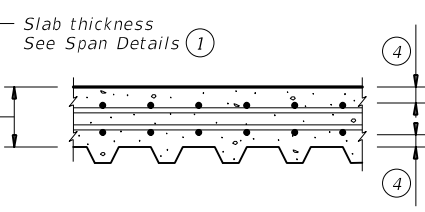
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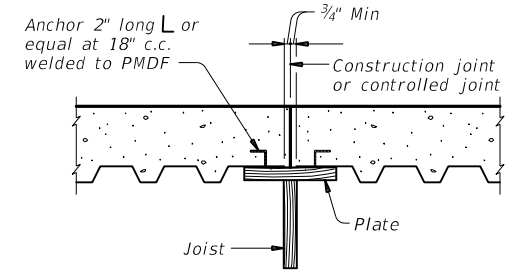
**ANGLE HEADER**

NOTE: This type is to be used for skewed ends only.

**TYPES OF END CLOSURES**



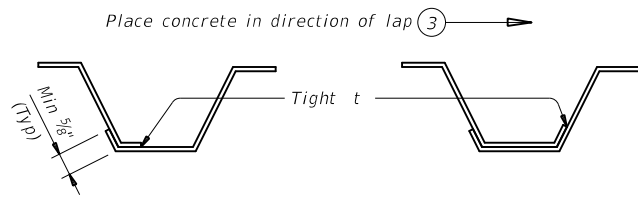
**TYP LONGITUDINAL SLAB SECTION**



Note: In spans where PMDF forms are used, timber forms must be used at construction joints. Adequate provision must be made to support edge of metal form and to provide anchorage of metal form to slab concrete where joined to wood forms.

**SECTION THRU CONSTRUCTION JOINT**

**FOR PRESTR CONC U-BEAM AND STEEL GIRDER BRIDGES:**  
 Unless shown elsewhere in the plans, size, spacing, and orientation of bottom mat of slab reinforcement must match the top mat of reinforcing shown on the span details except all bottom mat bars are to be #5. Bottom mat reinforcement and additional concrete is subsidiary to Item 422 "Concrete Superstructures."  
**FOR PRESTR CONC TX-GIRDER BRIDGES:**  
 See Miscellaneous Slab Details, Prestr Concrete I-Girders (IGMS) standard sheet for bottom mat reinforcing.



**SIDE LAP DETAILS**

- ① Slab thickness minus 5/8" if corrugations match reinforcing bars.
- ② Welding of form supports to tension angles will not be permitted. Other methods of providing wind hold down resistance for PMDF in tension angle zones will be considered. At least one layer of sheet metal must be provided between the angle and the weld joint.
- ③ The direction of concrete placement will be such that the upper layer of the form overlap is loaded first.
- ④ See Span details for cover requirements.

**GENERAL NOTES:**

Steel for Permanent Metal Deck Forms (PMDF) and support angles shall conform to ASTM A653, structural steel (SS), with coating designation G165. Steel must have a minimum yield strength of 33 ksi. Minimum thickness of PMDF is 20 gage and that of support angles and protective angles is 12 gage. Submit two copies of forming plans for PMDF to the Engineer. These plans must show all essential details of proposed form sheets, closures, fasteners, supports, connectors, special conditions and size and location of welds. These plans must clearly show areas of tension angles for steel beams and provisions for protecting the tension angles from welding notch effects by inclusion of separating sheet metal or other positive method. These plans must be designed, signed, and sealed by a licensed professional engineer. Department approval of these plans is not required, but the Department reserves the right to require modifications to the plans. The Contractor is responsible for the adequacy of these plans. The details and notes shown on this standard are to be used as a guide in preparation of the forming plans. All material, labor, tools and incidentals necessary to form a bridge deck with Permanent Metal Deck Forms is considered subsidiary to Item 422, "Concrete Superstructures".

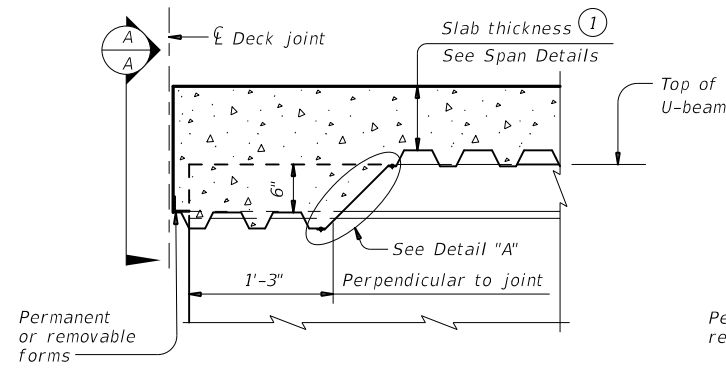
**DESIGN NOTES:**  
 As a minimum, PMDF and support angles must be designed for the dead load of the form, reinforcement and concrete plus 50 psf for construction loads. Flexural stresses due to these design loads must not exceed 75 percent of the yield strength of the steel. Allowable stress for weld metal must be 12,400 psi. Maximum deflection under the weight of forms, reinforcement and concrete or 120 psf, whichever is greater, shall not exceed the following:

- 1/180 of the form design span, but not more than 0.50", for design spans of 10' or less.
  - 1/240 of the form design span, but not more than 0.75", for design spans greater than 10'.
  - 1/240 of the form design span, but not more than 0.75", for all design spans of railroad overpass bridge spans fully or partially over railroad right-of-way, and for all bridge spans of railroad underpass structures.
- The form design span must not be less than the clear distance between beam angles, measured parallel to the form uses, minus 2".

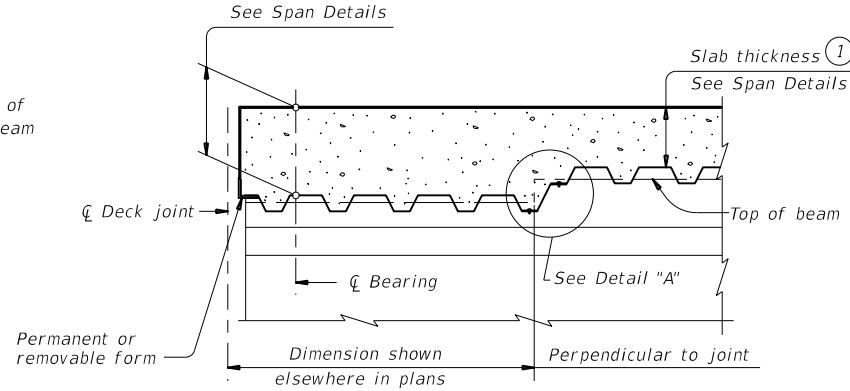
**CONSTRUCTION NOTES:**  
 Form sheets must not be permitted to rest directly on the top of beam angles. Form sheets must be securely fastened to form supports and must have a minimum bearing length of one inch at each end. Form supports must be placed in direct contact with beam angles. All attachments must be made by permissible welds, screws, bolts, clips or other means shown on the forming plans. All sheet metal assembly screws must be installed with torque-limiting devices to prevent stripping. Only welds or bolts must be used to support vertical loads. Welding and welds must be in accordance with the provisions of Item 448, "Structural Field Welding", pertaining to fillet welds. All welds must be made by a qualified welder in accordance with Item 448. All permanently exposed form metal, where the galvanized coating has been damaged, must be thoroughly cleaned and repaired in accordance with Item 445, "Galvanizing". Minor heat discoloration in areas of welds need not be touched up. Flutes must line up uniformly across the entire width of the structure where main reinforcing steel is located in the flutes. Construction joints will not be permitted unless shown on the plans. The location of and forming details for any construction joint used must be shown on the forming plans. Forms below a construction joint must be removed after curing of the slab. A sequence for uniform vibration of concrete must be approved by the Engineer prior to concrete placement. Attention must be given to prevent damage to the forms, yet provide proper vibration to prevent voids or honeycomb in the flutes and at headers and/or construction joints.

		<b>Bridge Division Standard</b>	
<h2>PERMANENT METAL DECK FORMS</h2>			
<h3>PMDF</h3>			
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©TxDOT	CON: April 2019	SECT: JOB	HIGHWAY
02-20: Modified box note by adding steel beams/girders and subsidiary.	0923 17	084	CR 392
12-21: Updated max deflection for RR.	DIST: BWD	COUNTY: COMANCHE	SHEET NO: 69

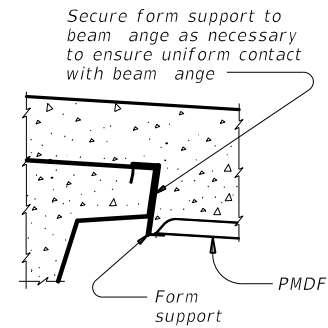
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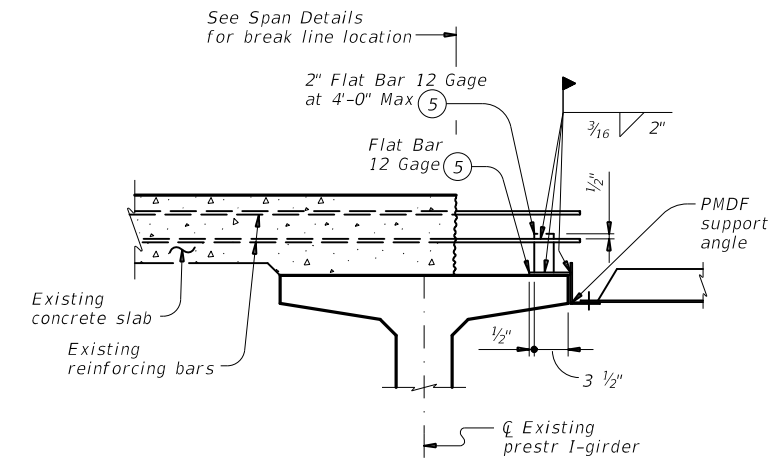
**AT THICKENED SLAB END FOR U-BEAMS**



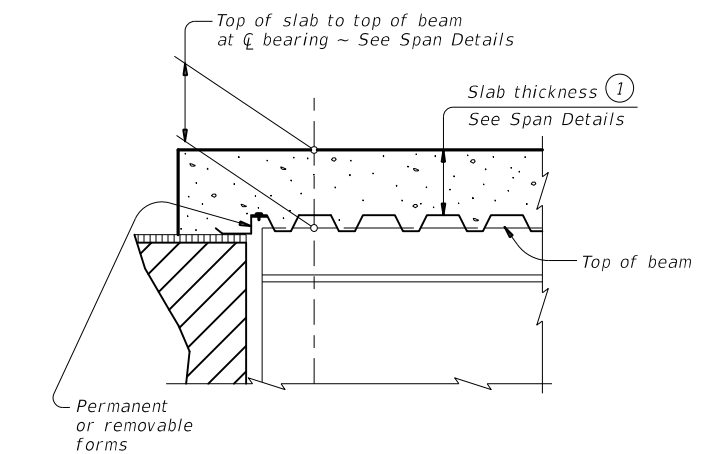
**AT THICKENED SLAB END FOR PRESTRESSED I-BEAMS, I-GIRDERS AND STEEL BEAMS**  
 Showing I-beam block-out. No block-out for I-girders or steel beams.



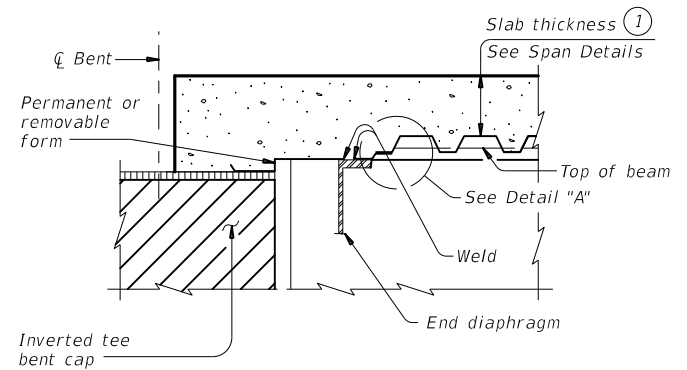
**SECTION A-A**



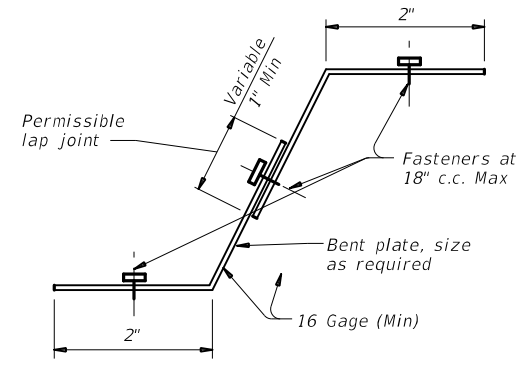
**SHOWING PRESTRESSED CONCRETE I-BEAMS, I-GIRDERS AND U-BEAMS**



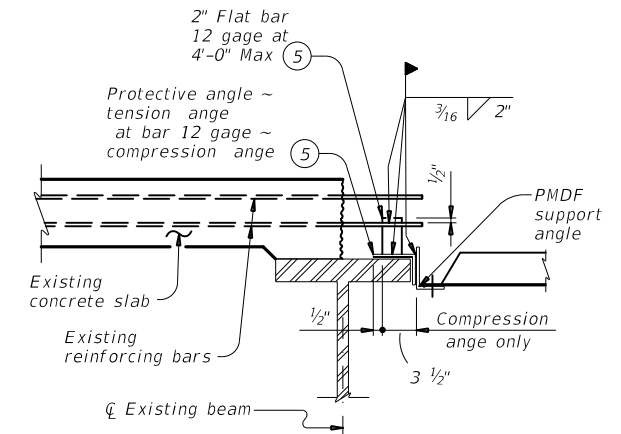
**AT SLAB OVER ABUTMENT BACKWALL OR INVERTED-T STEM FOR CONCRETE BEAMS WITHOUT THICKENED SLAB END**



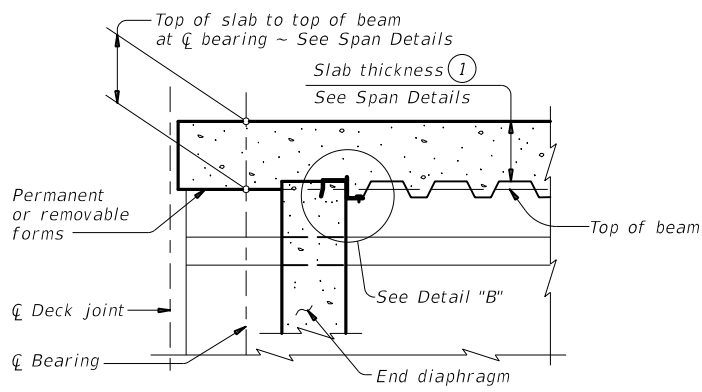
**AT SLAB OVER INVERTED-T STEM FOR STEEL BEAMS WITHOUT THICKENED SLAB END**



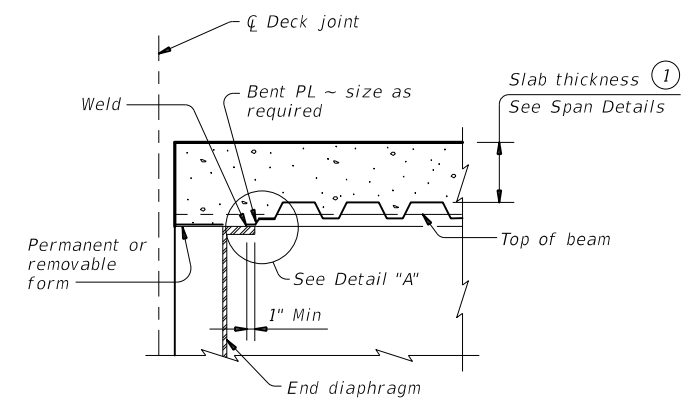
**DETAIL "A"**



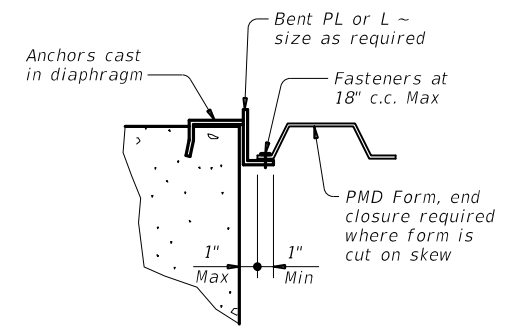
**SHOWING STEEL BEAMS**



**AT CONCRETE END DIAPHRAGM FOR PRESTRESSED I-BEAMS AND STEEL BEAMS**



**AT END DIAPHRAGM FOR STEEL BEAMS WITHOUT THICKENED SLAB END**



**DETAIL "B"**

**WIDENING DETAILS**

**DETAILS AT ENDS OF BEAMS**

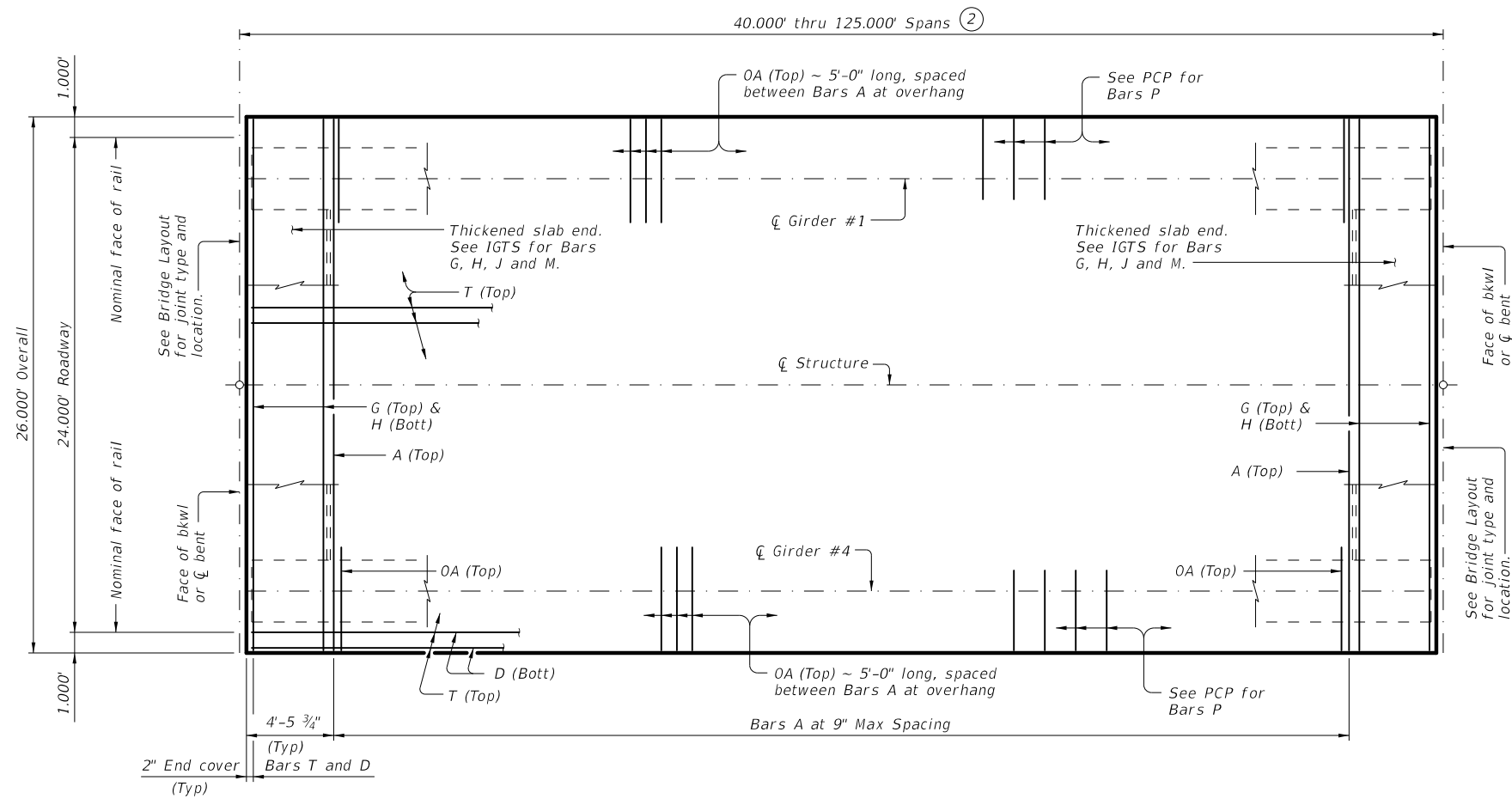
- 1 Slab thickness minus 5/16" if corrugations match reinforcing bars
- 5 Minimum yield stress of 12 gage bars shall be 40 ksi

SHEET 2 OF 2

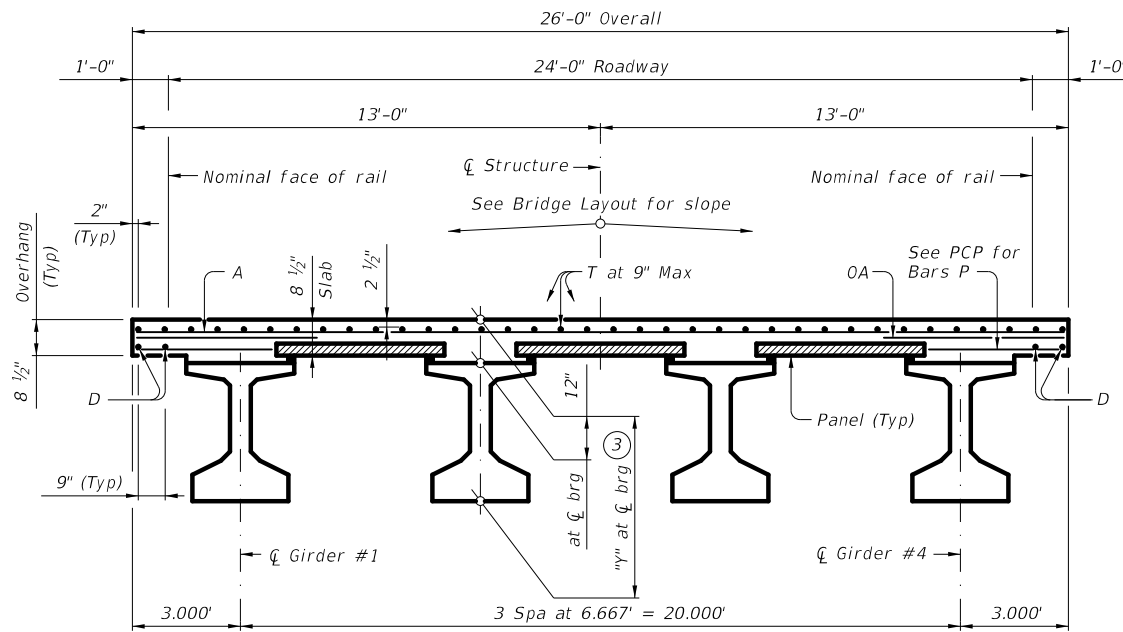
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<b>PERMANENT METAL DECK FORMS</b>					
<b>PMDF</b>					
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©TxDOT	April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS		0923	17	084	CR 392
02-20: Modified box note by adding steel beams/girders and subsidiary.		DIST	COUNTY	SHEET NO.	
12-21: Updated max deflection for RR.		BWD	COMANCHE	70	

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**PLAN** ①



**TYPICAL TRANSVERSE SECTION**  
 (Showing girder type Tx46)

TABLE OF SECTION DEPTHS	
GIRDER TYPE	"Y" AT $\bar{C}$ BRG ③
	Ft/In
Tx28	3'-4"
Tx34	3'-10"
Tx40	4'-4"
Tx46	4'-10"
Tx54	5'-6"

**BAR TABLE**

BAR	SIZE
A	#4
D	#4
G	#4
H	#4
J	#4
M	#4
OA	#5
P	#4
T	#4

- ① If multi-span units (with slab continuous over interior bents) are indicated on the Bridge Layout, see standard IGCS for adjustment to slab reinforcement and quantities.
- ② Span lengths for Prestressed Concrete I-Girder type:  
 Type Tx28 for spans lengths 40.000' thru 75.000'.  
 Type Tx34 for spans lengths 40.000' thru 85.000'.  
 Type Tx40 for spans lengths 40.000' thru 100.000'.  
 Type Tx46 for spans lengths 40.000' thru 115.000'.  
 Type Tx54 for spans lengths 40.000' thru 125.000'.
- ③ "Y" value shown is based on theoretical girder camber, dead load deflection from an 8 1/2" concrete slab, a constant roadway grade, and using precast panels (PCP). The Contractor will adjust this value as necessary for any roadway vertical curve.

HL93 LOADING SHEET 1 OF 2



**PRESTRESSED CONCRETE I-GIRDER SPANS (TYPE Tx28 THRU Tx54) 24' ROADWAY**

**SIG-24**

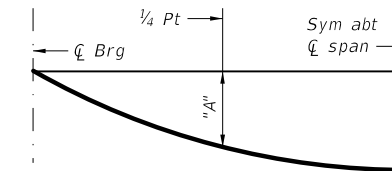
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©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0923	17	084	CR 392
10-19: Increased "X" and "Y" Values. 01-23: Removed PCP(D) reference.	DIST	COUNTY	SHEET NO.	
	BWD	COMANCHE	71	

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**TABLE OF DEAD LOAD DEFLECTIONS**

TYPE Tx28 GIRDERS			TYPE Tx34 GIRDERS			TYPE Tx40 GIRDERS			TYPE Tx46 GIRDERS			TYPE Tx54 GIRDERS		
SPAN LENGTH	"A"	"B"	SPAN LENGTH	"A"	"B"	SPAN LENGTH	"A"	"B"	SPAN LENGTH	"A"	"B"	SPAN LENGTH	"A"	"B"
Ft	Ft	Ft	Ft	Ft	Ft	Ft	Ft	Ft	Ft	Ft	Ft	Ft	Ft	Ft
40	0.007	0.010	40	0.004	0.006	40	0.003	0.004	40	0.002	0.003	40	0.001	0.002
45	0.012	0.017	45	0.007	0.010	45	0.005	0.007	45	0.004	0.005	45	0.002	0.003
50	0.019	0.027	50	0.011	0.016	50	0.007	0.010	50	0.005	0.007	50	0.004	0.005
55	0.028	0.040	55	0.017	0.024	55	0.011	0.016	55	0.008	0.011	55	0.005	0.007
60	0.041	0.057	60	0.024	0.034	60	0.016	0.022	60	0.011	0.015	60	0.007	0.010
65	0.056	0.079	65	0.033	0.047	65	0.022	0.031	65	0.015	0.021	65	0.010	0.014
70	0.077	0.108	70	0.046	0.064	70	0.030	0.042	70	0.021	0.029	70	0.014	0.019
75	0.102	0.143	75	0.061	0.085	75	0.040	0.056	75	0.027	0.038	75	0.018	0.025
			80	0.079	0.111	80	0.052	0.073	80	0.036	0.050	80	0.024	0.033
			85	0.102	0.143	85	0.066	0.093	85	0.046	0.064	85	0.030	0.042
						90	0.084	0.118	90	0.057	0.080	90	0.038	0.053
						95	0.105	0.147	95	0.071	0.100	95	0.047	0.066
						100	0.130	0.182	100	0.088	0.124	100	0.058	0.082
									105	0.108	0.151	105	0.071	0.100
									110	0.130	0.182	110	0.086	0.121
									115	0.156	0.219	115	0.103	0.144
									120			120	0.123	0.172
									125			125	0.145	0.203



**DEAD LOAD DEFLECTION DIAGRAM**

Calculated deflections shown are due to the concrete slab on interior girders only ( $E_c = 5000$  ksi). Adjust values as required for exterior girders and if optional slab forming is used. These values may require field verification.

**TABLE OF ESTIMATED QUANTITIES**

SPAN LENGTH	REINF CONCRETE SLAB	Prestressed Concrete Girders			TOTAL REINF STEEL <sup>5</sup>
		ABUT TO INT BT <sup>4</sup>	INT BT TO INT BT <sup>4</sup>	ABUT TO ABUT <sup>4</sup>	
Ft	SF	LF	LF	LF	Lb
40	1,040	158.00	158.00	158.00	2,392
45	1,170	178.00	178.00	178.00	2,691
50	1,300	198.00	198.00	198.00	2,990
55	1,430	218.00	218.00	218.00	3,289
60	1,560	238.00	238.00	238.00	3,588
65	1,690	258.00	258.00	258.00	3,887
70	1,820	278.00	278.00	278.00	4,186
75	1,950	298.00	298.00	298.00	4,485
80	2,080	318.00	318.00	318.00	4,784
85	2,210	338.00	338.00	338.00	5,083
90	2,340	358.00	358.00	358.00	5,382
95	2,470	378.00	378.00	378.00	5,681
100	2,600	398.00	398.00	398.00	5,980
105	2,730	418.00	418.00	418.00	6,279
110	2,860	438.00	438.00	438.00	6,578
115	2,990	458.00	458.00	458.00	6,877
120	3,120	478.00	478.00	478.00	7,176
125	3,250	498.00	498.00	498.00	7,475

- ④ Fabricator will adjust lengths for girder slopes as required.
- ⑤ Reinforcing steel weight is calculated using an approximate factor of 2.3 lbs/SF.

**MATERIAL NOTES:**

Provide Class S concrete ( $f'_c = 4,000$  psi).  
 Provide Class S (HPC) concrete if shown elsewhere in the plans.  
 Provide Grade 60 reinforcing steel.  
 Provide bar laps, where required, as follows:  
 Uncoated ~ #4 = 1'-7"  
 Epoxy coated ~ #4 = 2'-5"  
 Deformed welded wire reinforcement (WWR) (ASTM A1064) of equal size and spacing may be substituted for Bars A, D, OA, P or T unless noted otherwise.

**GENERAL NOTES:**

Designed according to AASHTO LRFD Bridge Design Specifications.  
 Multi-span units, with slab continuous over interior bents, may be formed with the details shown on this sheet and the 1-Girder Continuous Slab Detail (IGCS) standard.  
 See 1-Girder Thickened Slab End Details (IGTS) standard for details and quantity adjustments.  
 See Prestressed Concrete Panels (PCP) standard and Prestressed Concrete Panel Fabrication Details (PCP-FAB) standard for panel details not shown.  
 See 1-Girder Miscellaneous Slab Details (IGMS) standard for miscellaneous details.  
 See applicable rail details for rail anchorage in slab.  
 See Permanent Metal Deck Forms (PMD) standard for details and quantity adjustments if this option is used.  
 This standard does not support the use of transition bents.

Cover dimensions are clear dimensions, unless noted otherwise.

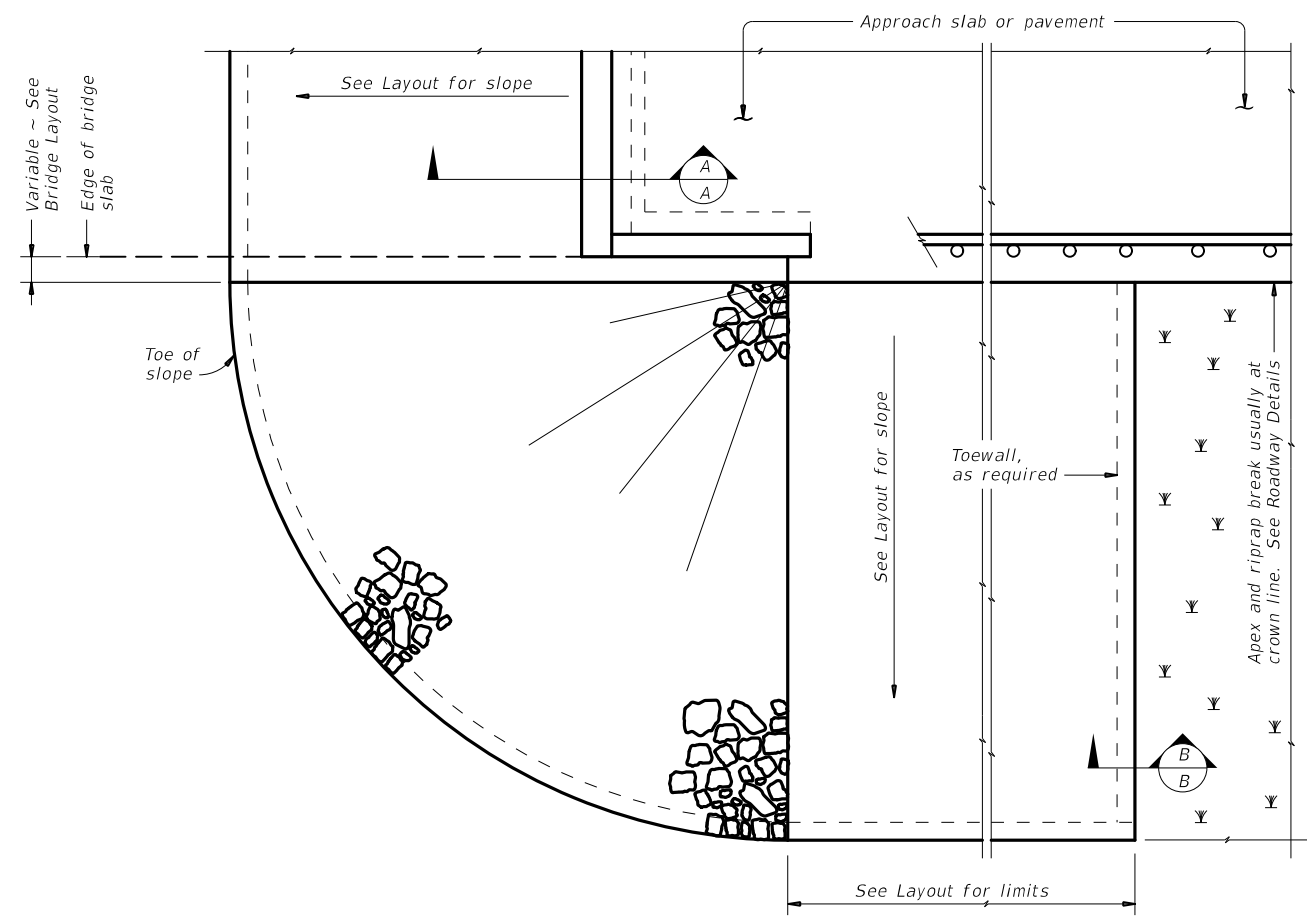
HL93 LOADING SHEET 2 OF 2

 Texas Department of Transportation	 Bridge Division Standard
<b>PRESTRESSED CONCRETE I-GIRDER SPANS</b> <b>(TYPE Tx28 THRU Tx54)</b> <b>24' ROADWAY</b>	
<b>SIG-24</b>	
FILE: IG-SIG2400-23.dgn	DN: JMH   CK: NRN   DW: JTR   CK: TAR
©TxDOT	August 2017
REVISIONS	CONT SECT JOB HIGHWAY
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01-23: Removed PCP(O) reference.	DIST COUNTY SHEET NO.
BWD	COMANCHE 72

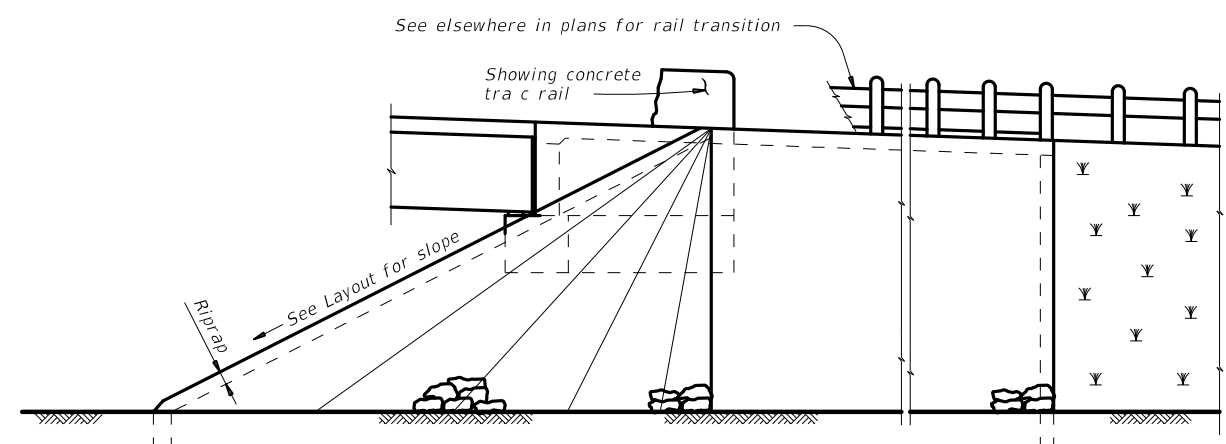


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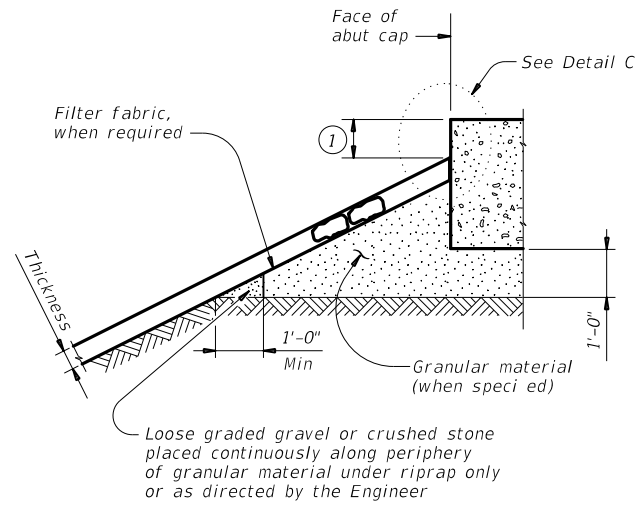
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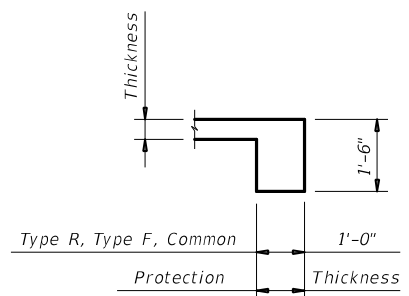
**PLAN**



**ELEVATION**

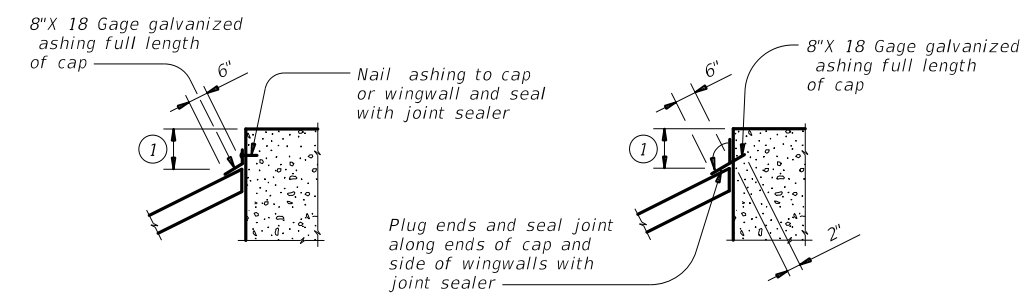


**SECTION A-A AT CAP**



**SECTION B-B**

Provide toewall when shoulder drain is located adjacent to limits of stone riprap. Omit toewall when thickness of protection riprap is greater than 18".



**CAP OPTION A**

**CAP OPTION B**

**DETAIL C**

① Top of cap to top of riprap dimension varies as directed by the Engineer. Provide 9" Min for beam/slab type bridges and 1'-6" for slab span, box beam, or slab beam bridges.

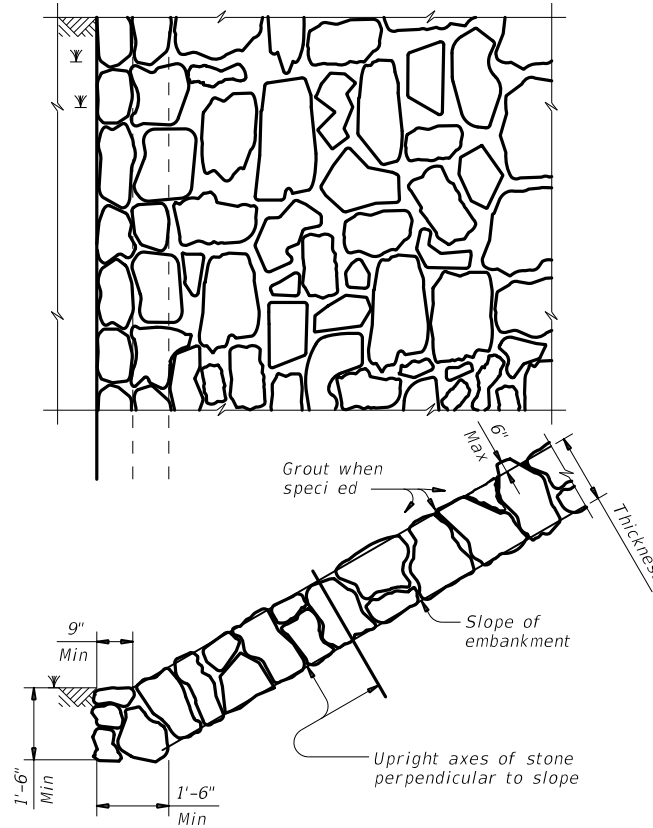
**GENERAL NOTES:**  
 Refer to Item 432, "Riprap" for stone size and gradation, and construction details. See Layout for limits and thickness of riprap specified.  
 See elsewhere in plans for locations and details of shoulder drains.

SHEET 1 OF 2

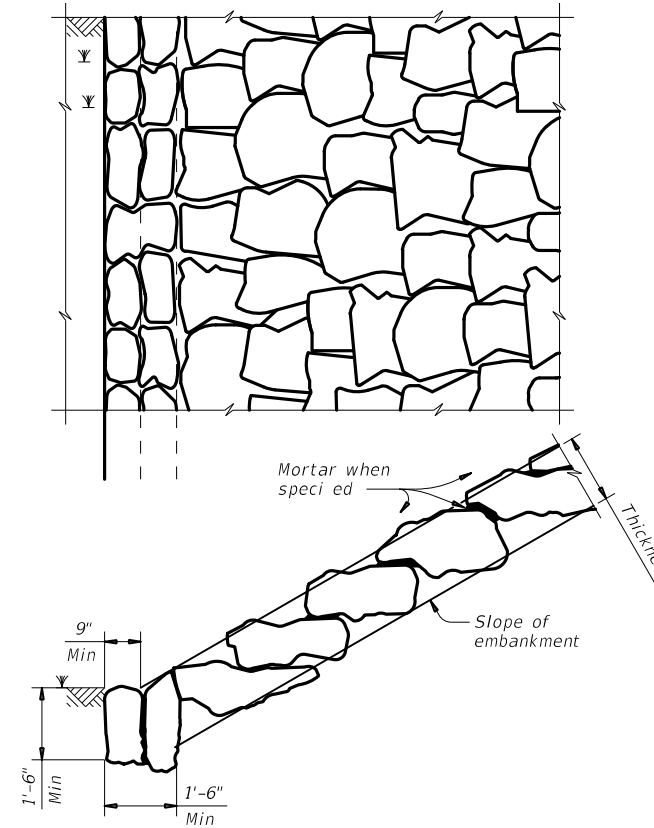
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<h2>STONE RIPRAP</h2>			
<h3>SRR</h3>			
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©TxDOT April 2019	CONT SECT	JOB	HIGHWAY
REVISIONS	0923 17	084	CR 392
DIST	COUNTY	SHEET NO.	
BWD	COMANCHE	73	

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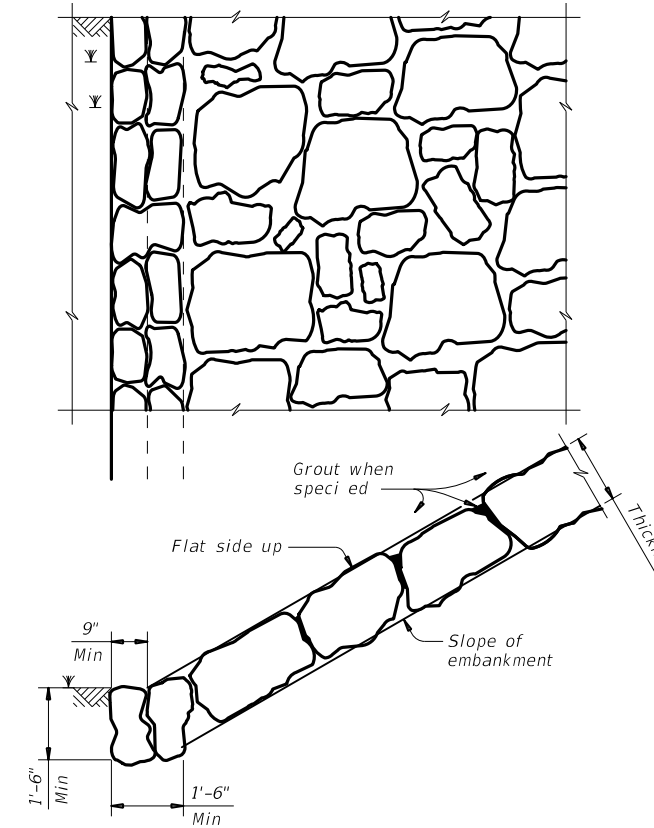
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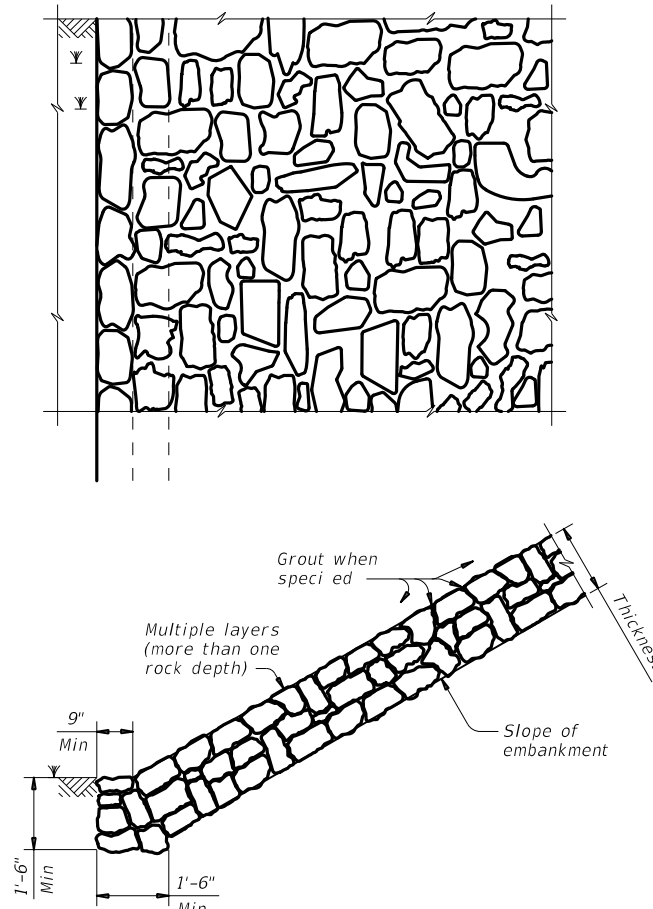
**FIGURE 1 ~ TYPE R STONE RIPRAP**  
dry or grouted



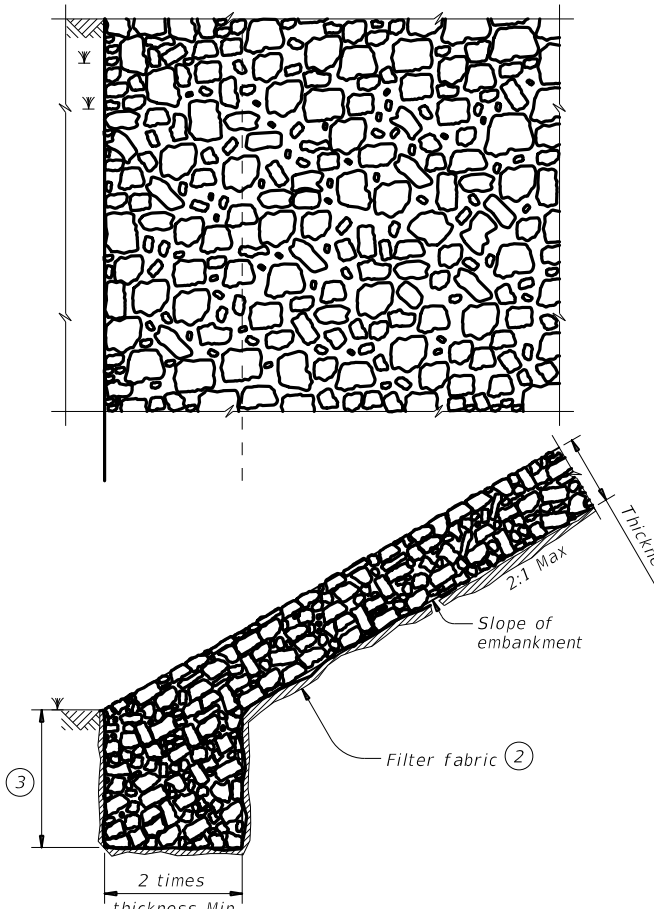
**FIGURE 2 ~ TYPE F STONE RIPRAP**  
dry or mortared



**FIGURE 3 ~ TYPE F STONE RIPRAP**  
grouted

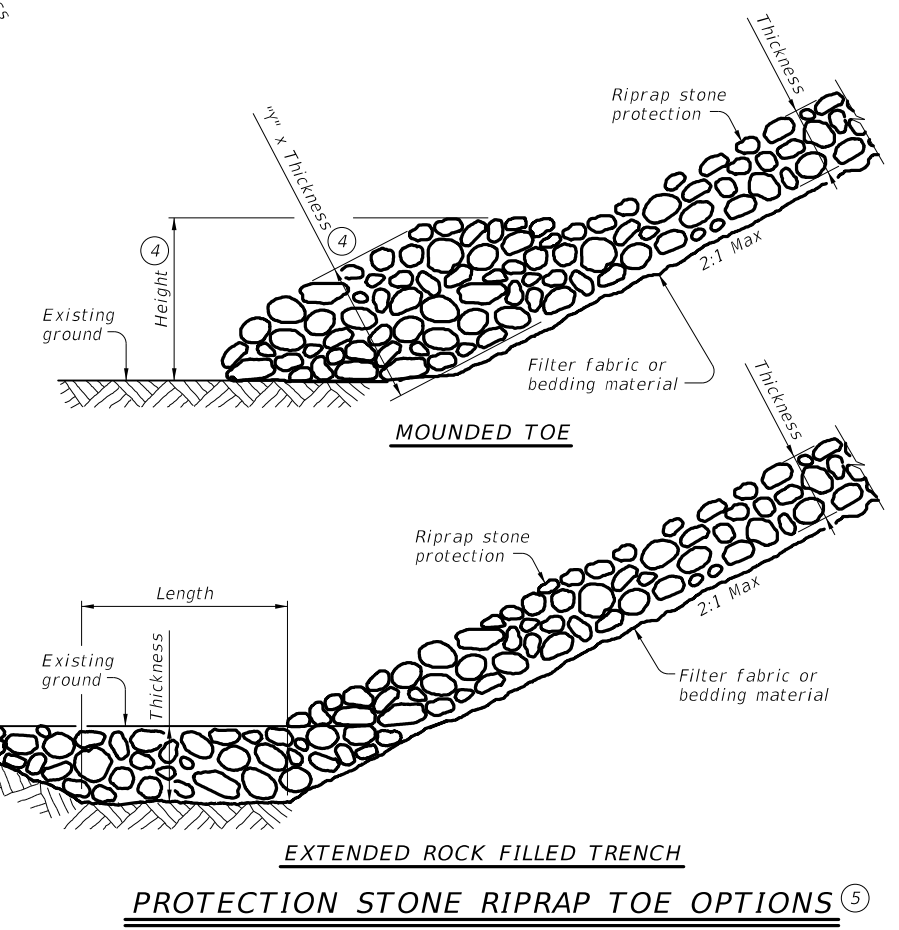


**FIGURE 4 ~ COMMON STONE RIPRAP**  
dry or grouted



**FIGURE 5 ~ PROTECTION STONE RIPRAP**

- ② Provide bedding material instead of filter fabric if shown elsewhere in plans. See layout for thickness of bedding material.
- ③ Minimum toe depth is the larger of the maximum scour depth or 2 times the riprap thickness.
- ④ "y" and Height need to be defined. See layout or detail sheet for values if this option is used.
- ⑤ List Stone Protection as size (XX inch) and thickness (YY inch) on the layout.  
Example: Riprap (Stone Protection) XX inch, Thickness = YY inch.



**PROTECTION STONE RIPRAP TOE OPTIONS**

SHEET 2 OF 2

Texas Department of Transportation  
 Bridge Division Standard

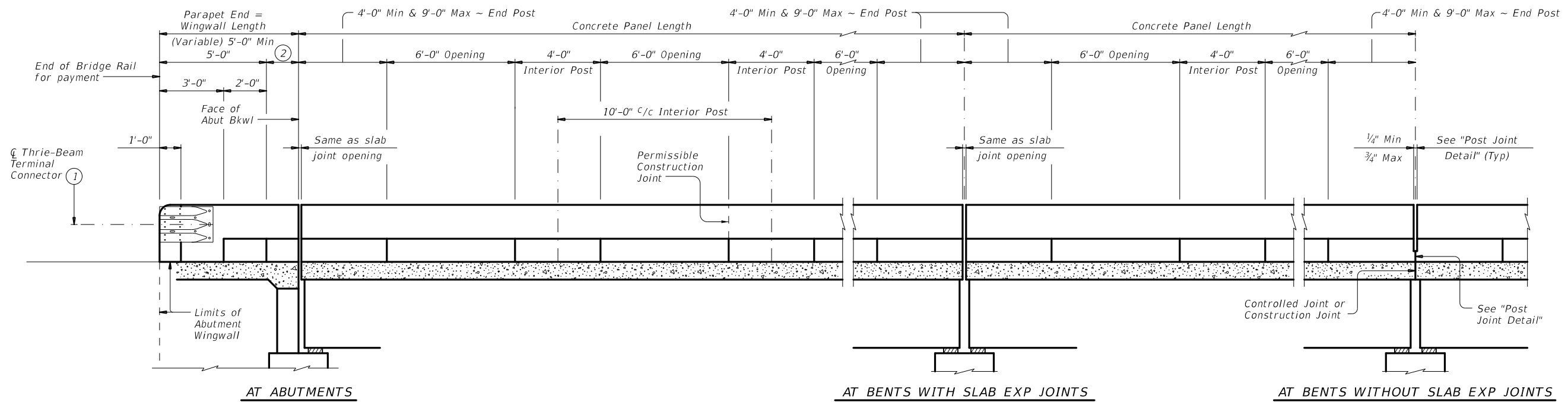
**STONE RIPRAP**

**SRR**

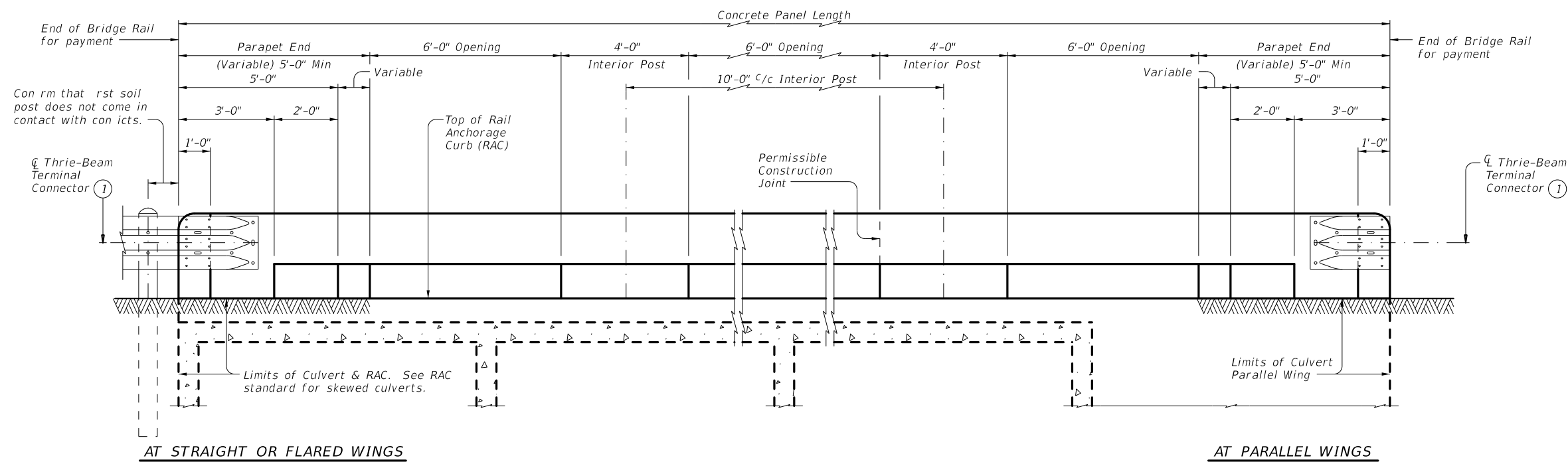
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**ROADWAY ELEVATION OF RAIL ON BRIDGE**



**ROADWAY ELEVATION OF RAIL ON BOX CULVERTS**

Showing 0° skew culvert. Skewed culverts similar. See RAC standard for details not shown. Vertical joints in concrete rail are not required, unless shown elsewhere.

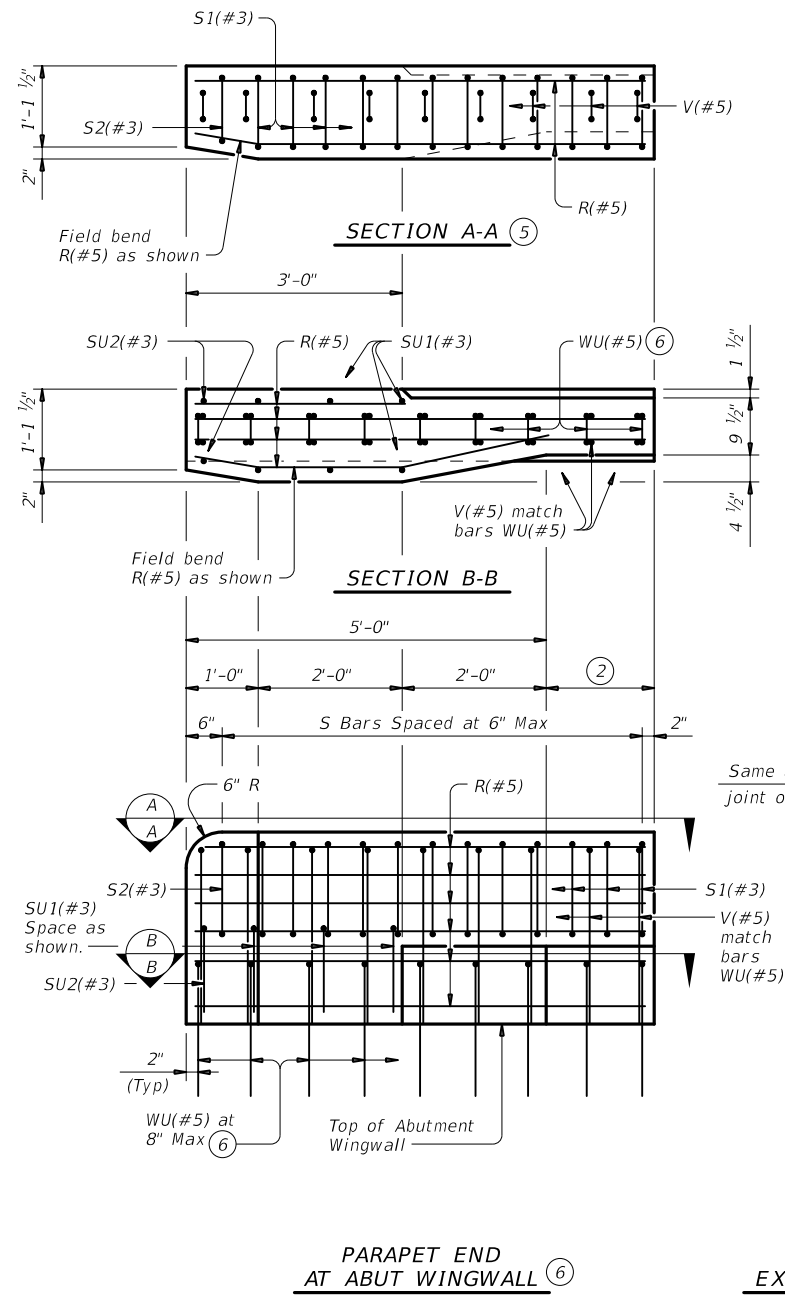
- ① Terminal Connectors and associated hardware are to be paid for under the Item "Metal Beam Guard Fence". Attach Metal Beam Guard Fence Transitions to the bridge rail and extend along the embankment unless otherwise shown in the plans.
- ② Wingwall Length minus 5'-0" (Varies)

SHEET 1 OF 3

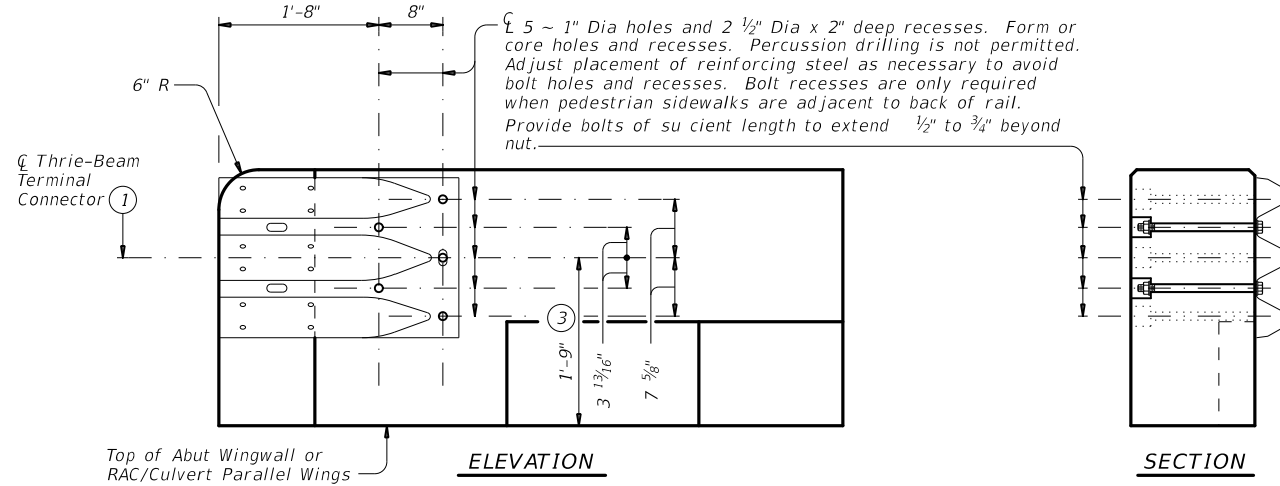
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<h3>TYPE T223</h3>			
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REVISIONS	0923	17	084
	DIST	COUNTY	SHEET NO.
	BWD	COMANCHE	75

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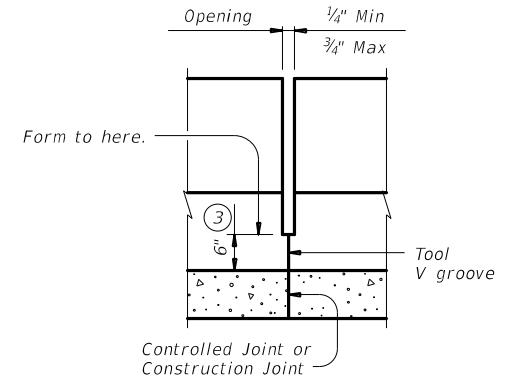
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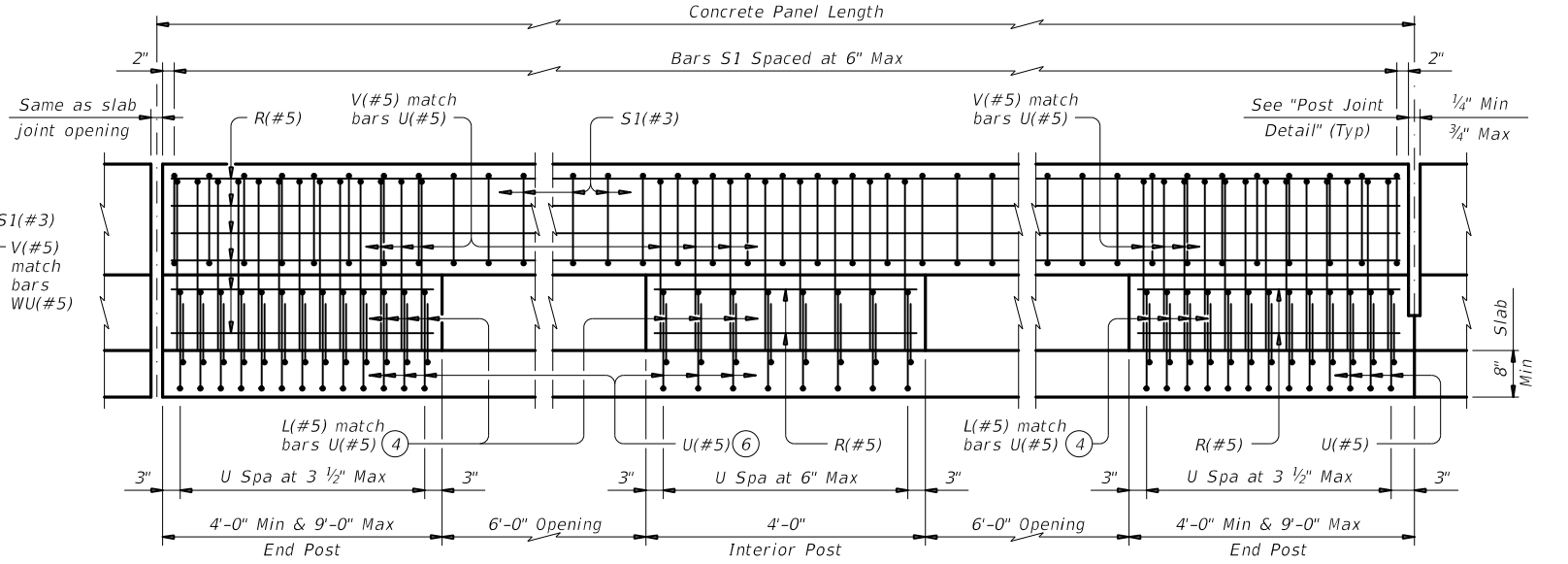
PARAPET END AT ABUT WINGWALL ⑥



TERMINAL CONNECTION DETAILS



POST JOINT DETAIL



ELEVATION SHOWING TYPICAL REINFORCING PLACEMENT

Showing rail on slab. Rail on box culvert similar.

- ① Terminal Connectors and associated hardware are to be paid for under the Item "Metal Beam Guard Fence". Attach Metal Beam Guard Fence Transitions to the bridge rail and extend along the embankment unless otherwise shown in the plans.
- ② Wingwall Length minus 5'-0" (Varies)
- ③ Increase 2" for structures with overlay.
- ④ Bars L(#5) are part of rail reinforcing and are included in unit price bid for railing. Space with Bars U. Bars L match slab bar cover. Bars L may be bundled with top slab reinforcing if spacing is equivalent.
- ⑤ Bars SU1(#3), SU2(#3) and WU(#5) not shown for clarity.
- ⑥ Substitute Bars U(#5) for Bars WU(#5) when parapet end is located on anchorage curb over culvert top slab. Use Bars WU(#5) in culvert parallel wings.

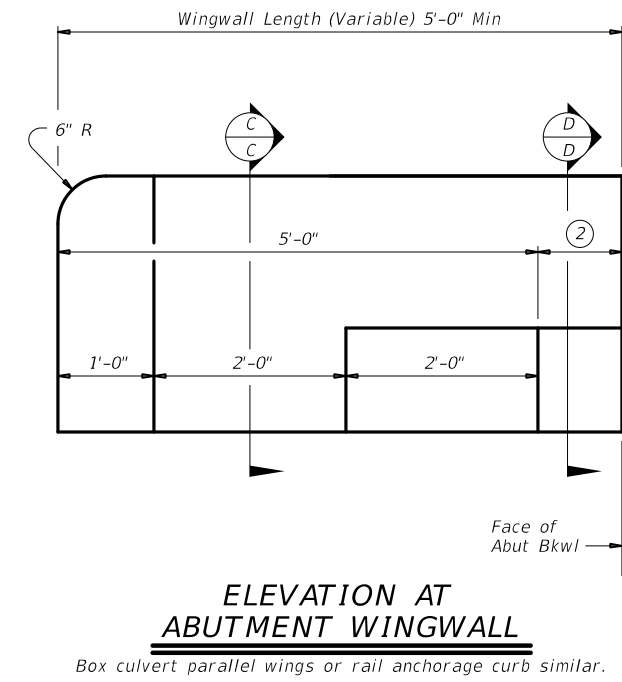
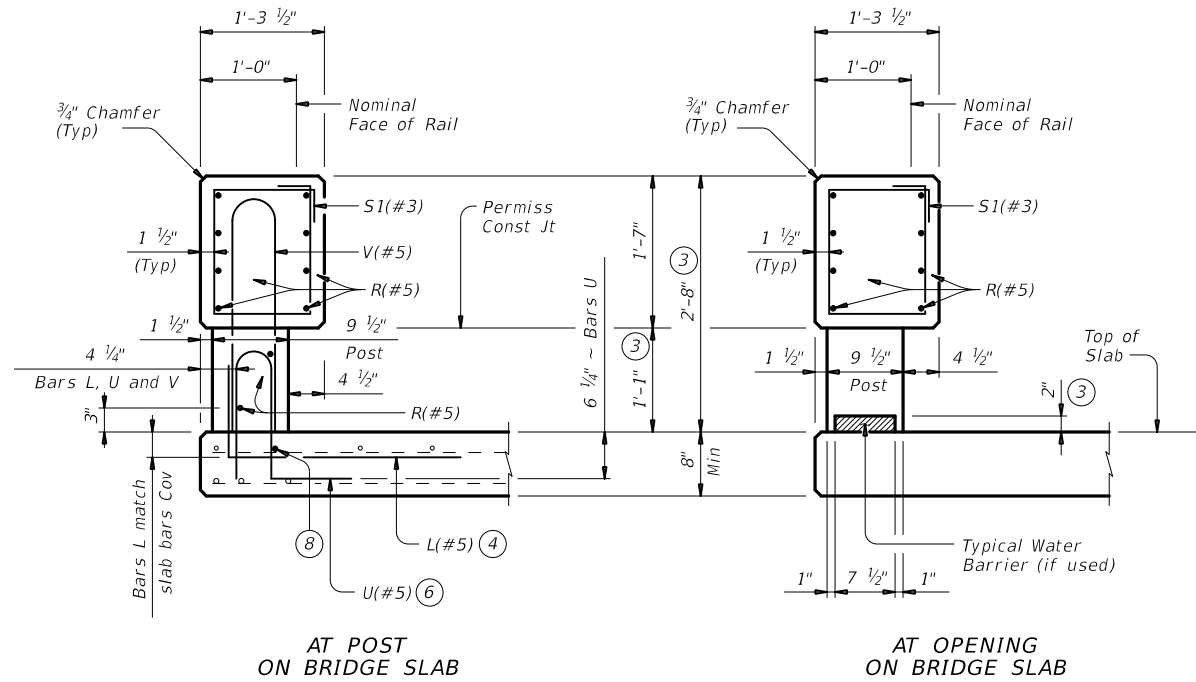
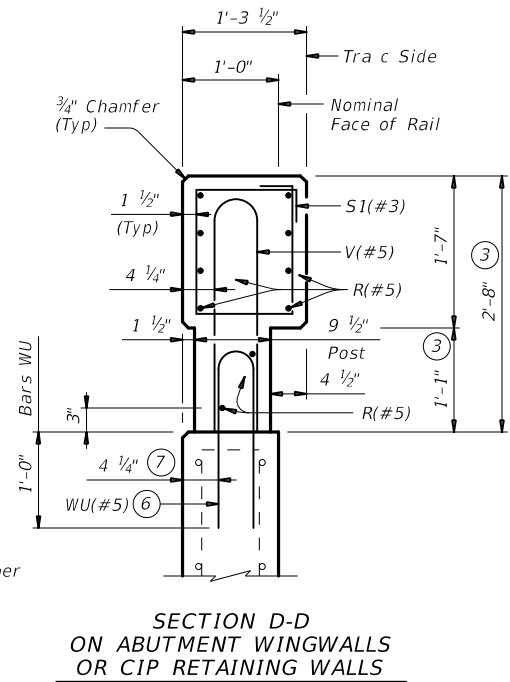
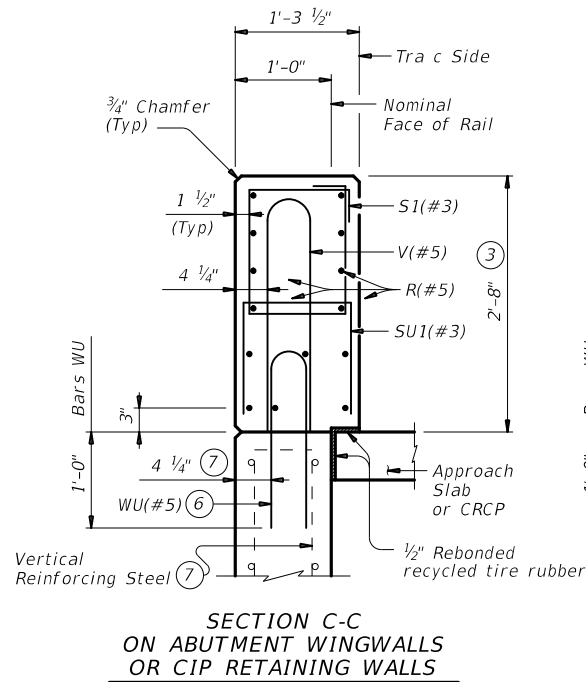
Texas Department of Transportation  
 Bridge Division Standard

TRAFFIC RAIL

TYPE T223

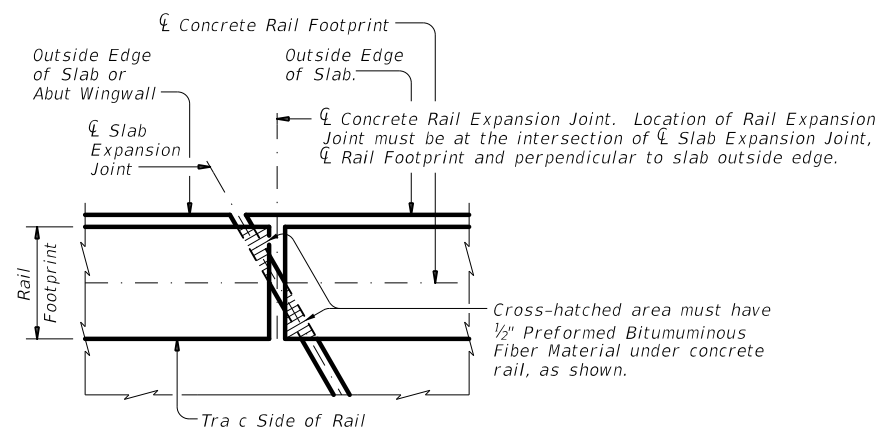
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REVISIONS	0923	17	084	CR 392
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	BWD	COMANCHE	76	

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**SECTIONS THRU RAIL**  
 Sections on box culverts similar.

- ② Wingwall Length minus 5'-0" (Varies)
- ③ Increase 2" for structures with overlay.
- ④ Bars L(#5) are part of rail reinforcing and are included in unit price bid for railing. Space with Bars U. Bars L match slab bar cover. Bars L may be bundled with top slab reinforcing if spacing is equivalent.
- ⑥ Substitute Bars U(#5) for Bars WU(#5) when parapet end is located on anchorage curb over culvert top slab. Use Bars WU(#5) in culvert parallel wings.
- ⑦ When vertical reinforcing has closer clear cover over horizontal reinforcing in abutment wingwalls on tra c side of wall, move the horizontal wingwall/retaining wall reinforcing to the inside of Bars WU where bars connect.
- ⑧ Top longitudinal slab bar may be adjusted laterally 3" plus or minus to tie reinforcing.
- ⑨ At the Contractor's option, Bars V may be replaced by extending Bars U to 2'-5 1/4" above the roadway surface without overlay.



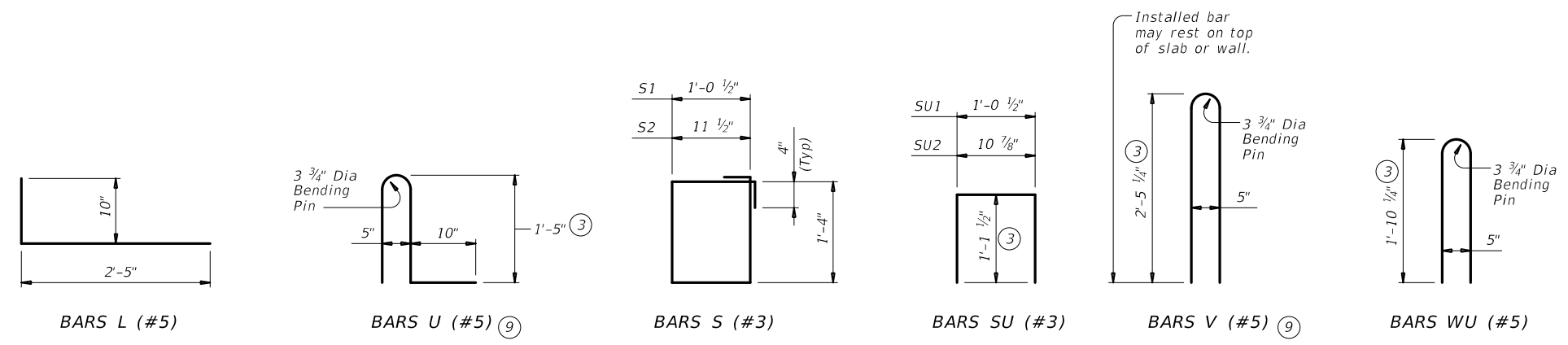
**PLAN OF RAIL AT EXPANSION JOINTS**  
 Example showing Slab Expansion Joints without breakbacks.

**CONSTRUCTION NOTES:**  
 Face of rail and parapet must be vertical transversely unless otherwise shown in the plans or approved by the Engineer.  
 Provide water barriers at openings draining onto undercrossing roadways and sidewalks. They may be cast-in-place or precast in convenient lengths and bonded to the bridge deck with an approved epoxy cement.  
 Chamfer all exposed corners.

**MATERIAL NOTES:**  
 Provide Class "C" concrete. Provide Class "C" (HPC) if required elsewhere.  
 Provide Grade 60 reinforcing steel.  
 Epoxy coat or galvanize all reinforcing steel if slab bars are epoxy coated or galvanized.  
 Deformed Welded Wire Reinforcing (WWR) (ASTM A1064) of equal size and spacing may be substituted for Bars U, V, and WU unless noted otherwise. Provide the same laps as required for reinforcing bars.  
 Provide bar laps, where required, as follows:  
 Uncoated or galvanized ~ #5 = 2'-0"  
 Epoxy coated ~ #5 = 3'-0"

**GENERAL NOTES:**  
 This rail has been evaluated by full-scale crash test to meet MASH TL-3 criteria. This rail can be used for speeds of 50 mph and greater when a TL-3 rated guard fence transition is used. When a TL-2 rated guard fence transition is used, this rail can only be used for speeds of 45 mph and less.  
 Do not use this railing on bridges with expansion joints providing more than 5" movement.  
 Rail anchorage details shown on this standard may require modification for select structure types. See appropriate details elsewhere in plans for these modifications.  
 Shop drawings are not required for this rail.  
 Average weight of railing with no overlay is 358 plf.

Cover dimensions are clear dimensions, unless noted otherwise. Reinforcing bar dimensions shown are out-to-out of bar.



SHEET 3 OF 3

		<b>Bridge Division Standard</b>	
<h2>TRAFFIC RAIL</h2>			
<h3>TYPE T223</h3>			
FILE: RL-T223-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR
REV: 0923 17	CON: 084	SECT: 084	JOB: CR 392
DIST: BWD	COUNTY: COMANCHE	SHEET NO. 77	

Prepared by \*\*\*\*\*  
 DATE: 12/14/2023 8:22:34 AM  
 FILE: I:\BWDSDTEAM\Design Projects\Comanche\0923-17-083 CR 382 @ Resley Cr. - Replace Bridge and Approaches\Environmental\EPIC\_092317083.dgn UPDATED 6/1/2017

During the planning phase of project development the following environmental permits, issues, and commitments have been developed during coordination with resource agencies, local governmental entities, and the general public. Any change orders and/or deviations from the final design must be reported to the Engineer prior to the commencement of construction activities, as additional environmental clearances may be required.

### I. Clean Water Act, Sec. 402 Texas Pollutant Discharge Elimination System

(Addresses CGP and MS4 Storm Water requirements for the project.)  
 (In the event that the Contractor implements a PSL on or within one mile of the project, a Site Notice and/or a NOI will apply.)

No Action Required  Required Action

Action No. 1	Commitment No. 1
The project disturbs less than one acre of surface area. The contractor is responsible for the PSL as defined in the Standard Specifications for Construction and Maintenance of Highways, Street, and Bridges (2014 Edition, Section 7.7.6, Page 42). The total disturbed acreage is the combined acreage to be disturbed on the project and the contractor's PSL.	Refer to the SW3P Plan Sheet, BMPs and Detail. It will address sweeping, chemical storage, sanitary waste, and all other management practices.

The EPIC must be updated if the disturbed area increases to one or more acres during the course of construction (refer to following sections). It may become necessary to post a site notice and/or NOI for the project and/or PSL.

MS4 operators that receives discharge from the project: -N/A-

### II. Clean Water Act, Section 401 and 404 Compliance

(Addresses Nationwide Permits, Individual Permits, and Wetlands.)  
 (Filling, dredging, or excavating in any water bodies, rivers, creeks, streams, wetlands, or wet area is prohibited unless specified in the USACE permit and approved by the Engineer.)  
 (When temporary fills implemented, only stated TxDOT standards will be used unless written authorization for an alternative is obtained from the Engineer. No equipment is allowed in any stream channel below the Ordinary High Water Mark except on temporary stream crossings or drill pads.)

No Action Required  404 Permit and 401 Certification Required

Permit	Required Action	Waters of the US	App. Plan Sheet(s)
NWP #14	Adher to permit and general/regional conditions	Resley Creek	See Bridge Layout

### Best Management Practices for applicable 401 General Conditions:

- General Condition 12 - Categories I and II BMPs required
- Category I (Erosion Control)
- Temporary Vegetation
  - Mulch
  - Interceptor Swale
  - Erosion Control Compost
  - Compost Filter Berms and Socks
  - Blankets, Matting
  - Sod
  - Diversion Dike
  - Mulch Filter Berms and Socks
  - Compost Blankets
- Category II (Sedimentation Control)
- Sand Bag Berm
  - Silt Fence
  - Triangular Filter Dike
  - Stone Outlet Sediment Traps
  - Erosion Control Compost
  - Compost Filter Berms and Socks
  - Rock Berm
  - Hay Bale Dike
  - Brush Berms
  - Sediment Basins
  - Mulch Filter Berms and Socks

- General Condition 25 - Category III BMPs required
- Category III (Post-Construction TSS Control)
- Retention/Irrigation
  - Extended Detention Basin
  - Vegetative Filter Strips
  - Grassy Swales
  - Erosion Control Compost
  - Compost Filter Berms and Socks
  - Constructed Wetlands
  - Wet Basins
  - Vegetation-Lined Ditches
  - Sand Filter Systems
  - Mulch filter Berms and Socks
  - Sedimentation Chambers

### III. Cultural Resources

(Addresses any special circumstances associated with cultural resources, such as archeological or historic sites.)  
 (Upon discovery of archeological artifacts (bones, burnt rock, flint, pottery, etc.) cease work in the immediate area and contact the Engineer immediately.)

No Action Required  Required Action

Action No.	Station (Rt/Lt)	Commitment
1.	---	---

### IV. Vegetation Resources

(Addresses any special circumstances associated with vegetation, such as large trees to be avoided, or mitigation that will occur as part of the project.)

No Action Required  Required Action

Action No.	Station (Rt/Lt)	Commitment
1.	All	Avoid non-mow locations for stockpiles and equipment parking/storage.
2.	Project Limits	Preserve native vegetation to the extent practical. Contractor must adhere to Construction Specification Requirements Specs 162, 164, 192, 193, 506, 730, 751, 752 in order to comply with requirements for invasive species, beneficial landscaping, and tree/brush removal commitments.

### V. Federal Listed, Proposed, Threatened, Endangered Species, Critical Habitat, State Listed Species, Candidate Species, and Migratory Bird Treaty Act (MBTA)

(Addresses any special habitat that may need to be avoided, lists any threatened or endangered species where habitat was observed and might be impacted within the project area, and lists any precautions such as nesting seasons for migratory birds.)

No Action Required  Required Action

Species Potentially within Project Area & Description	Habitat Description
The contractor should be aware that there could be various species in the project area including the Texas Horned Lizard and the Zone-tailed Hawk. Avoid placing Project Specific Locations (PSLs) in areas with harvester ants. If there are large nests observed in trees to be removed contact District Environmental Coordinator prior to cutting down. Other species may also be in the area and harm to any species should be avoided. Contact the District Environmental Coordinator, Andrew Chisholm (325) 643-0442 with any questions.	

The Migratory Bird Treaty Act of 1918 states that it is unlawful to kill, capture, collect, possess, buy, sell, trade, or transport any migratory bird, nest, young, feather, or egg in part or in whole, without a federal permit issued in accordance within the Act's policies and regulations. Migration patterns would not be affected by the proposed project. The contractor will remove all old migratory bird nests from any structure where work would be done from September 1 through the end of February. In addition, the contractor will be prepared to prevent migratory birds from building nests between March 1 and August 31, per the Environmental Permits, Issues, and Commitments (EPIC) plans. In the event that migratory birds are encountered on-site during project construction, adverse impacts on protected birds, active nests, eggs, and/or young shall be avoided.

### VI. Hazardous Material or Contamination Issues

(Addresses any previously identified high risk sites associated with hazardous materials that may be encountered during construction.)

Comply with the Hazard Communication Act (the Act) for personnel who will be working with hazardous materials by conducting safety meetings prior to beginning construction and making workers aware of potential hazards in the workplace. Ensure that all workers are provided with personal protective equipment appropriate for any hazardous materials used. Obtain and keep on-site Material Safety Data Sheets (MSDS) for all hazardous products used on the project, which may include, but are not limited to the following categories: Paints, acids, solvents, asphalt products, chemical additives, fuels and concrete curing compounds or additives. Provide protected storage, off bare ground and covered, for products which may be hazardous. Maintain product labelling as required by the Act. Maintain an adequate supply of on-site spill response materials, as indicated in the MSDS. In the event of a spill, take actions to mitigate the spill as indicated in the MSDS, in accordance with safe work practices, and contact the District Spill Coordinator immediately. The Contractor shall be responsible for the proper containment and cleanup of all product spills.

Contractor will follow all applicable storage and management requirements for liquid oil products, liquid petroleum products, and other chemical liquids as per 40 CFR 112 (a.k.a. SPCC) and/or TCEQ Construction General Permit for storm water management.

Contact the Engineer if any of the following are detected:  
 Dead or distressed vegetation (not identified as normal)  
 Trash piles, drums, canisters, barrels, etc.  
 Undesirable smells/odors  
 Underground storage tanks  
 Evidence of leaching or seepage of substances  
 Any other evidence indicating possible hazardous materials or contamination discovered on-site

Does the project involve any bridge class structure rehabilitation or replacements (bridge class structure not including box culverts)?

Yes  No

If "No", then no further action is required.  
 If "Yes", then TxDOT is responsible for completing an asbestos assessment/inspection. Are the results of the asbestos inspection positive (is asbestos present)?

Yes  No

If "Yes", then TxDOT must retain a Texas Department of State Health Services (DSHS) licensed asbestos consultant to assist with the notification, develop abatement/mitigation procedures, and perform management activities as necessary. The notification form to DSHS must be postmarked at least 15 working days prior to scheduled abatement and/or demolition.

If "No", then TxDOT is still required to notify DSHS 15 working days prior to any scheduled demolition.

In either case, the Contractor is responsible for providing the date(s) for abatement activities and/or demolition with careful coordination between the Engineer and asbestos consultant in order to minimize construction delays and subsequent claims.

Bridges on this project may contain Lead-Containing Paint (LCP) or other items that contain lead. The location of (LCP) is identified in the General Notes. Item 6.10.1.2 in the 2014 TxDOT Standard Specifications shall be utilized for this project.

### VII. Other Environmental Issues

(Addresses any other environmental issues that may not have been covered in other sections.)

No Action Required  Required Action

Action No.	Station (Rt/Lt)	Commitment
------------	-----------------	------------

#### LIST OF ABBREVIATIONS

- BMP: Best Management Practice
- CGP: Construction General Permit
- DSHS: Texas Department of State Health Services
- FEMA: Federal Emergency Management Agency
- FHWA: Federal Highway Administration
- MOA: Memorandum of Agreement
- MOU: Memorandum of Understanding
- MS4: Municipal Separate Stormwater Sewer System
- MBTA: Migratory Bird Treaty Act
- NOI: Notice of Intent
- NOT: Notice of Termination
- NWP: Nationwide Permit
- SPCC: Spill Prevention Control and Countermeasure
- SW3P: Storm Water Pollution Prevention Plan
- PCN: Pre-Construction Notification
- PSL: Project Specific Location
- TCEQ: Texas Commission on Environmental Quality
- TPDES: Texas Pollutant Discharge Elimination System
- TPWD: Texas Parks and Wildlife Department
- TxDOT: Texas Department of Transportation
- T&E: Threatened and Endangered Species
- USACE: U.S. Army Corp of Engineers
- USFWS: U.S. Fish and Wildlife Service

**CR 392 ENVIRONMENTAL PERMITS, ISSUES, AND COMMITMENTS (EPIC)**

©2023 Texas Department of Transportation BROWNWOOD DISTRICT

CONT	SECT	JOB	HIGHWAY
0923	17	084	CR 392
DIST	COUNTY	SHEET NO.	
BWD	COMANCHE	78	

**STORMWATER POLLUTION PREVENTION PLAN (SWP3):**

This SWP3 has been developed in accordance with TxDOT policy for projects disturbing less than 1 acre of soil, and not part of a larger common plan of development.

This SWP3 is consistent with requirements specified in applicable stormwater plans, and the project's environmental permits, issues, and commitments (EPICs).

**1.0 SITE/PROJECT DESCRIPTION**

**1.1 PROJECT CONTROL SECTION JOB (CSJ):**  
CSJ : 0923-17-084

**1.2 PROJECT LIMITS:**

From: AT RESLEY CREEK

To: \_\_\_\_\_

**1.3 PROJECT COORDINATES:**

BEGIN: (Lat) 31°50'45.86"N , (Long) 98°13'14.82"W

END: (Lat) 31°50'22.36"N , (Long) 98°14'06.15"W

**1.4 TOTAL PROJECT AREA (Acres):** 0.91

**1.5 TOTAL AREA TO BE DISTURBED (Acres):** 0.35

**1.6 NATURE OF CONSTRUCTION ACTIVITY:**

Replacement of bridge consisting of replace bridge and approaches.

**1.7 MAJOR SOIL TYPES:**

Soil Type	Description
100% (Frio) silty clay, (0 to 1) percent slopes	100% of the AOI, Occasionally flooded, high water holding capacity, well drained, low runoff, slight erosion

**1.8 PROJECT SPECIFIC LOCATIONS (PSLs):**

PSLs must be depicted on the Environmental Layout Sheets in Attachment 1.2 of this SWP3. PSLs may be identified during preconstruction meetings or during the construction process. Please choose from the options below:

- PSLs determined during preconstruction meeting
- PSLs determined during construction
- No PSLs planned for construction

Type	Sheet #s

All off-ROW PSLs required by the Contractor are the Contractor's responsibility. The Contractor shall secure all permits required by local, state, federal laws for off-ROW PSLs. The contractor shall provide diagrams, areas of disturbance, acreage, and BMPs for all off-ROW PSLs within one mile of the project.

**1.9 CONSTRUCTION ACTIVITIES:**

(Use the following list as a starting point when developing the Construction Activity Schedule and Ceasing Record in Attachment 2.3.)

- Mobilization
- Install sediment and erosion controls
- Blade existing topsoil into windrows, prep ROW, clear and grub
- Remove existing pavement
- Grading operations, excavation, and embankment
- Excavate and prepare subgrade for proposed pavement widening
- Remove existing culverts, safety end treatments (SETs)
- Remove existing metal beam guard fence (MBGF), bridge rail
- Install proposed pavement per plans
- Install culverts, culvert extensions, SETs
- Install mow strip, MBGF, bridge rail
- Place flex base
- Rework slopes, grade ditches
- Blade windrowed material back across slopes
- Revegetation of unpaved areas
- Achieve site stabilization and remove sediment and erosion control measures

- Other: \_\_\_\_\_
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_

**1.10 POTENTIAL POLLUTANTS AND SOURCES:**

- Sediment laden stormwater from stormwater conveyance over disturbed area
- Fuels, oils, and lubricants from construction vehicles, equipment, and storage
- Solvents, paints, adhesives, etc. from various construction activities
- Transported soils from offsite vehicle tracking
- Construction debris and waste from various construction activities
- Contaminated water from excavation or dewatering pump-out water
- Sanitary waste from onsite restroom facilities
- Trash from various construction activities/receptacles
- Long-term stockpiles of material and waste

- Other: \_\_\_\_\_
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_

**1.11 RECEIVING WATERS:**

Receiving waters must be depicted on the Environmental Layout Sheets in Attachment 1.2 of this SWP3. Include Segment # for receiving waters.

Tributaries	Classified Waterbody
Resley Creek (1221A)	*Leon River below Proctor Lake-1221 Category: 5c/ Parameter: Bacteria in water (Recreating Use)
No TMDLs or I-Plans were identified.	

\* Add (\*) for impaired waterbodies with pollutant in ( ).

**1.12 ROLES AND RESPONSIBILITIES: TxDOT**

- Development of plans and specifications
- Perform SWP3 inspections
- Maintain SWP3 records and update to reflect daily operations
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_

**1.13 ROLES AND RESPONSIBILITIES: CONTRACTOR**

- Day To Day Operational Control
- Maintain schedule of major construction activities
- Install, maintain and modify BMPs
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_

**STORMWATER POLLUTION PREVENTION PLAN (SWP3) (Less Than 1 Acre)**

FED. RD. DIV. NO.	PROJECT NO.			SHEET NO.
23				79
STATE	STATE DIST.	COUNTY		
TEXAS	BWD	COMANCHE		
CONT.	SECT.	JOB	HIGHWAY NO.	
0923	17	084	CR 392	

**STORMWATER POLLUTION PREVENTION PLAN (SWP3):**

**2.0 BEST MANAGEMENT PRACTICES (BMPs) AND CONTROLS, INSPECTION, AND MAINTENANCE**

The Contractor shall be the responsible party for implementing the BMPs described herein and for complying with the SWP3 for control of erosion and sedimentation during day-to-day operations. The Contractor shall implement changes to this SWP3 approved by TxDOT within the times specified in this SWP3 or the CGP.

**2.1 EROSION CONTROL AND SOIL STABILIZATION BMPs:**

**T / P**

- Protection of Existing Vegetation
- Vegetated Buffer Zones
- Soil Retention Blankets
- Geotextiles
- Mulching/ Hydromulching
- Soil Surface Treatments
- Temporary Seeding
- Permanent Planting, Sodding or Seeding
- Biodegradable Erosion Control Logs
- Rock Filter Dams/ Rock Check Dams
- Vertical Tracking
- Interceptor Swale
- Riprap
- Diversion Dike
- Temporary Pipe Slope Drain
- Embankment for Erosion Control
- Paved Flumes
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_

**2.2 SEDIMENT CONTROL BMPs:**

**T / P**

- Biodegradable Erosion Control Logs
- Dewatering Controls
- Inlet Protection
- Rock Filter Dams/ Rock Check Dams
- Sandbag Berms
- Sediment Control Fence
- Stabilized Construction Exit
- Floating Turbidity Barrier
- Vegetated Buffer Zones
- Vegetated Filter Strips
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

**2.3 PERMANENT CONTROLS:**

(Coordinate post-construction BMPs with appropriate TxDOT maintenance sections.)

BMPs To Be Left In Place Post Construction:

Type	Stationing	
	From	To
No permanent controls are planned.		

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

**2.4 OFFSITE VEHICLE TRACKING CONTROLS:**

- Excess dirt/mud on road removed daily
- Haul roads dampened for dust control
- Loaded haul trucks to be covered with tarpaulin
- Stabilized construction exit
- Daily street sweeping
- Other: DIRT/MUD WILL BE REMOVED FROM ROADWAY AS NECESSARY
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_

**2.5 POLLUTION PREVENTION MEASURES:**

- Chemical Management
- Concrete and Materials Waste Management
- Debris and Trash Management
- Dust Control
- Sanitary Facilities
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_

**2.6 VEGETATED BUFFER ZONES:**

Natural vegetated buffers shall be maintained as feasible to protect adjacent surface waters. If vegetated natural buffer zones are not feasible due to site geometry, the appropriate additional sediment control measures have been incorporated into this SWP3.

Type	Stationing	
	From	To
Infeasible, insufficient space between toe of slope and fence line.		
SCF & ECL	9+57.00	13+82.00

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

**2.7 ALLOWABLE NON-STORMWATER DISCHARGES:**

- Fire hydrant flushings
- Irrigation drainage
- Pavement washwater (where spills or leaks have not occurred, and detergents are not used)
- Potable water sources
- Springs
- Uncontaminated groundwater
- Water used to wash vehicles or control dust
- Other allowable non-stormwater discharges as allowed by TPDES GP TXR150000.

**2.8 DEWATERING:**

Dewatering discharges of accumulated stormwater, groundwater, and surface water including discharges from dewatering of trenches, excavations, foundations, vaults, and other points of accumulation are prohibited unless managed by appropriate controls to prevent and minimize the offsite discharge of sediment and other pollutants.

**2.9 INSPECTIONS:**

All disturbed areas and erosion and sediment control devices shall be inspected at least once every seven (7) days. Inspections shall be performed by TxDOT as indicated on the Field Inspection and Maintenance Report Form 2118 and retained in Attachment 2.3 of this SWP3 .

**2.10 MAINTENANCE:**

Control measures shall be properly installed according to specifications. If it is determined that a BMP or control measure is not operating effectively, maintenance must be accomplished as soon as possible and before the next anticipated rain event, but in no case later than 7 calendar days after being able to access the site. Maintenance shall be performed by the Contractor as indicated on the Field Inspection and Maintenance Report Form 2118 and retained in Attachment 2.3 of this SWP3.

**STORMWATER POLLUTION PREVENTION PLAN (SWP3) (Less Than 1 Acre)**

FED. RD. DIV. NO.	PROJECT NO.			SHEET NO.
23				80
STATE	STATE DIST.	COUNTY		
TEXAS	BWD	COMANCHE		
CONT.	SECT.	JOB	HIGHWAY NO.	
0923	17	084	CR 392	



CK:  
DW:  
CK:  
DW:

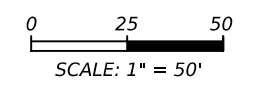
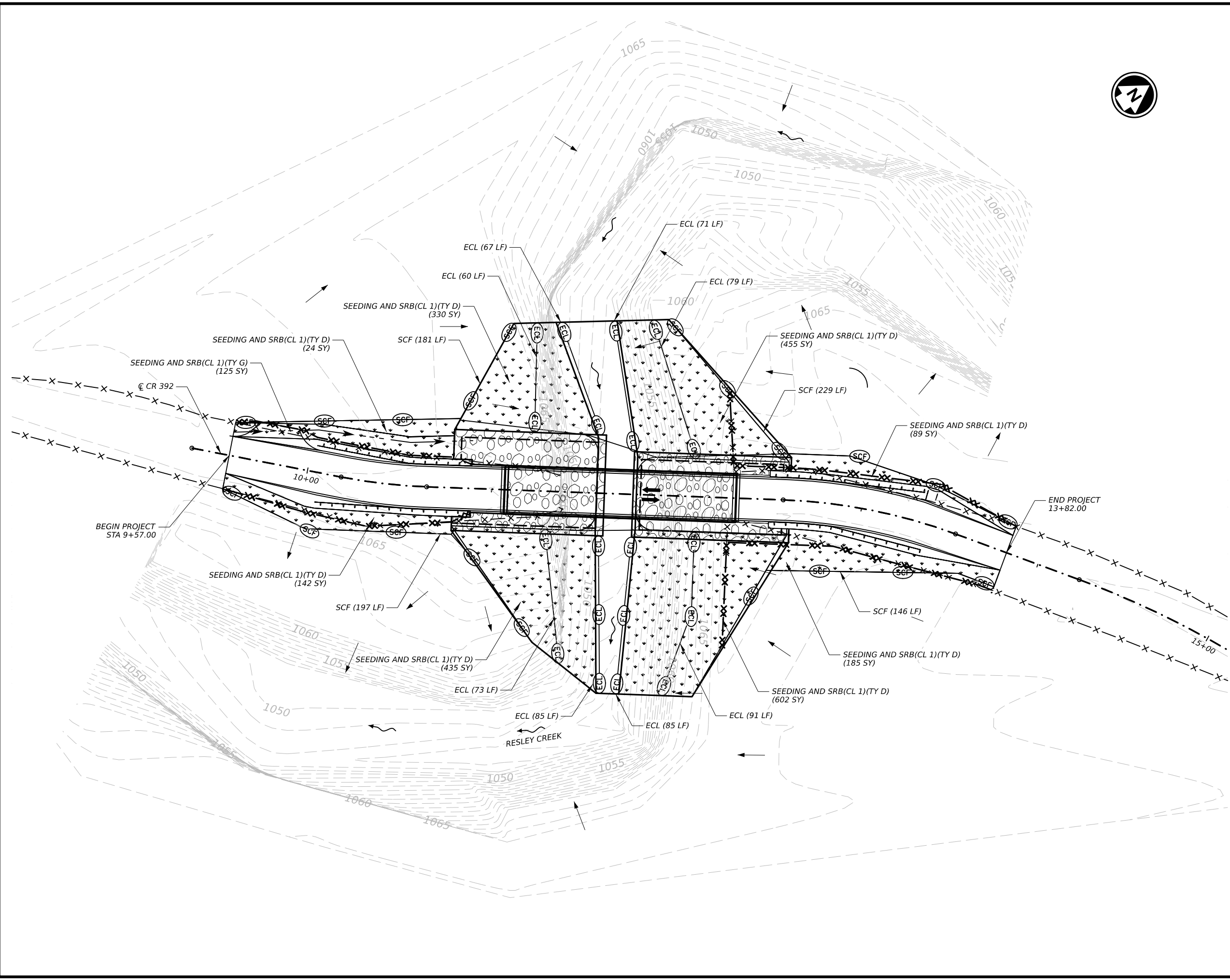
**LEGEND**

- ← TRAFFIC FLOW DIRECTION
- DRAINAGE FLOW DIRECTION
- ~ CHANNEL FLOW DIRECTION
- ECL TEMP EROSION CONTROL LOG
- SCF TEMP SEDIMENT CONTROL FENCE
- ~ EROSION CONTROL LOG
- ▭ SEEDING AND SOIL RETENTION BLANKET



**NOTES**

1. FINAL LOCATIONS OF EROSION CONTROL DEVICES SHALL BE APPROVED BY THE ENGINEER.
2. SRB (CL 1)(TY D) INTENDED FOR DITCH AND CHANNEL SLOPES. SRB (CL 2)(TY G) INTENDED FOR 10'-WIDE STRIP ALONG DITCH FLOWLINE.



*Luis A. González*

NO.	DATE	REVISION	APPROV.

3131 Briarpark Dr, Suite 200  
 Houston, Texas 77042  
 (713) 622-1444

CR 392 @ RESLEY CREEK

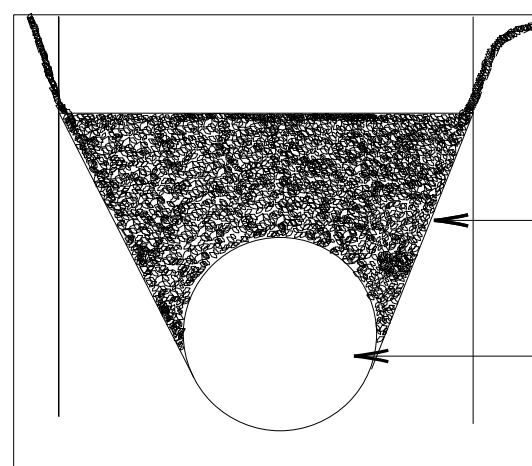
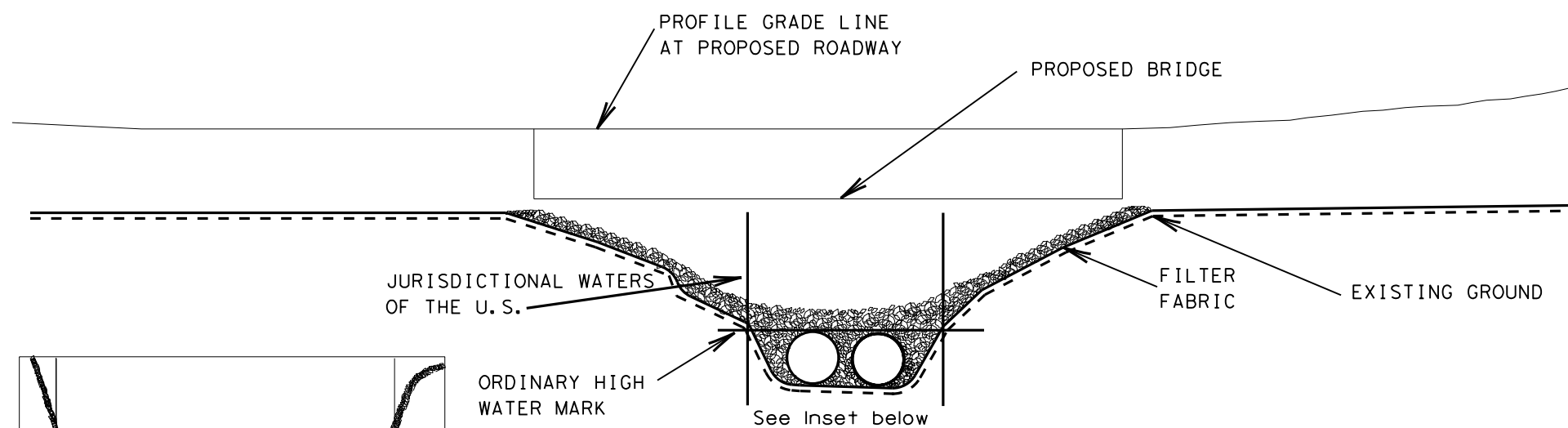
**SWP3  
LAYOUT**

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0923	17	084	CR 392
DIST		COUNTY	SHEET NO.
BWD		COMANCHE	81

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# TEMPORARY CROSSING



Inset

NON-ERODIBLE MATERIAL (4" to 6" rock)

TEMPORARY CULVERT(S)

CAPACITY OF CULVERT(S) SHALL BE ADEQUATE TO CONVEY THE LOW FLOW OF WATER

Note: Temporary crossing will not be paid for directly but will be considered subsidiary to pertinent items.

DRAWING NOT TO SCALE

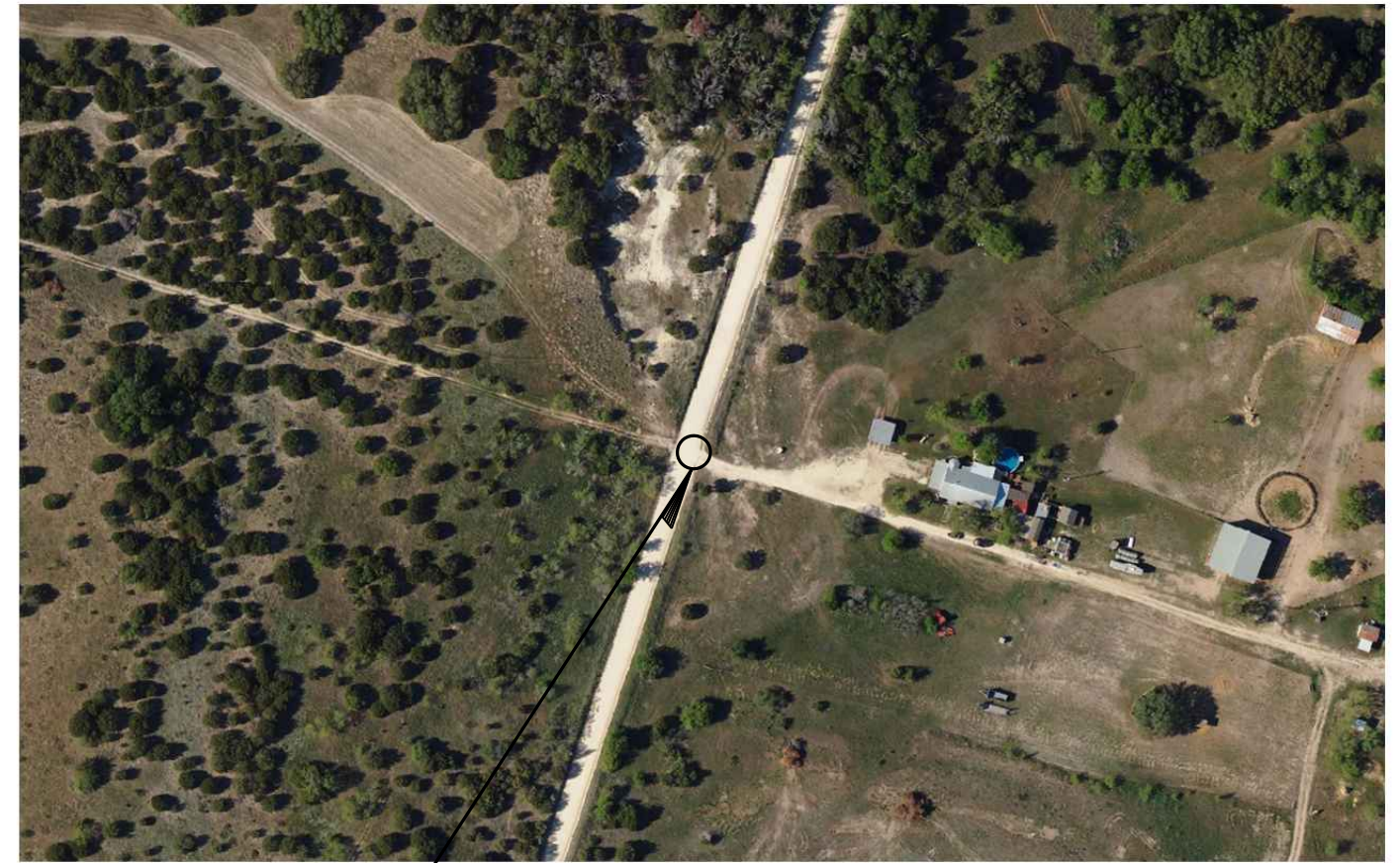
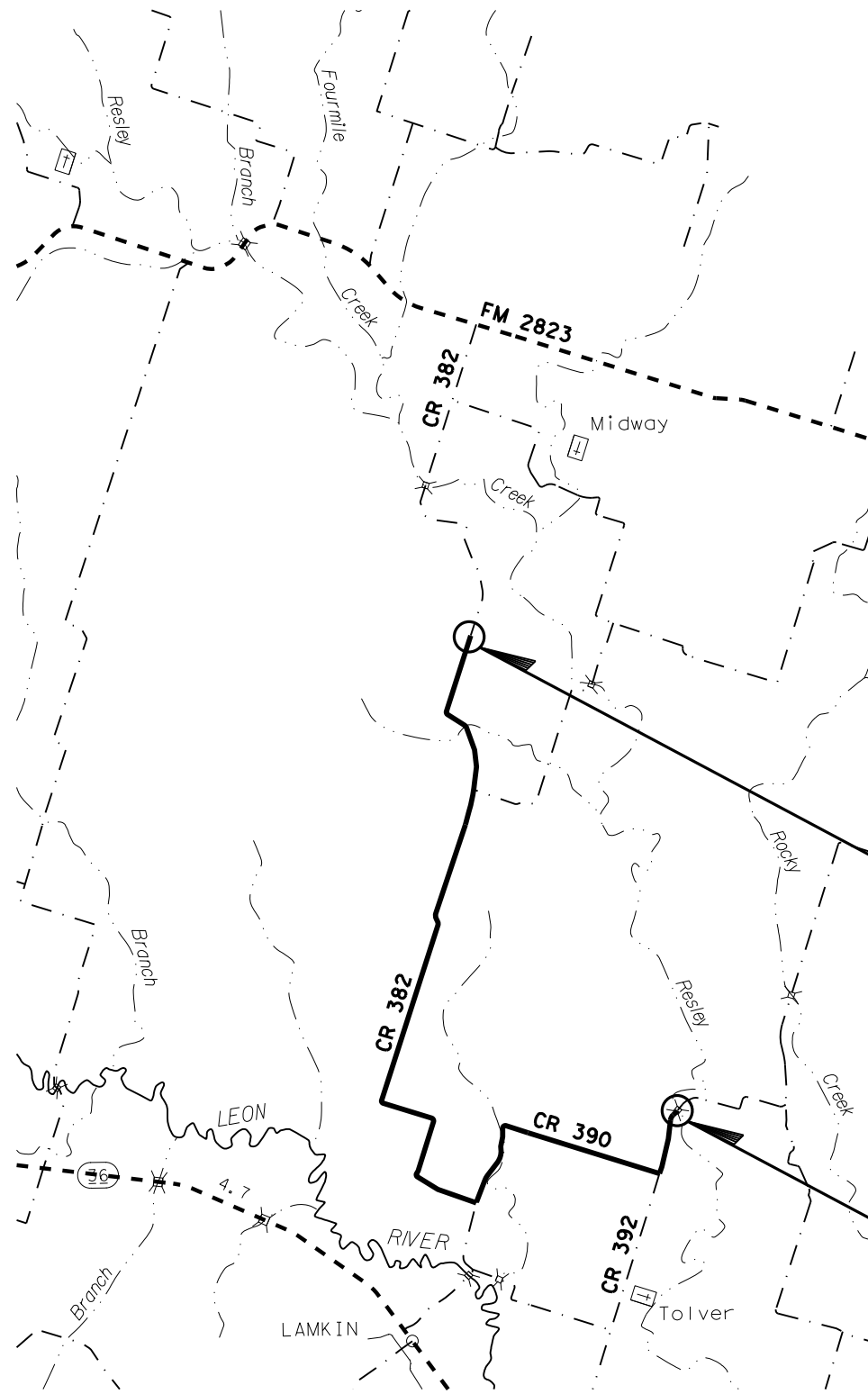
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CR 392  
 TEMP CROSSING  
 DETAIL  
 0923-17-084



CONT	SECT	JOB	HIGHWAY
0923	17	084	CR 392
DIST	COUNTY		SHEET NO.
BWD	COMANCHE		82

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Transport Length = 7.0 Miles

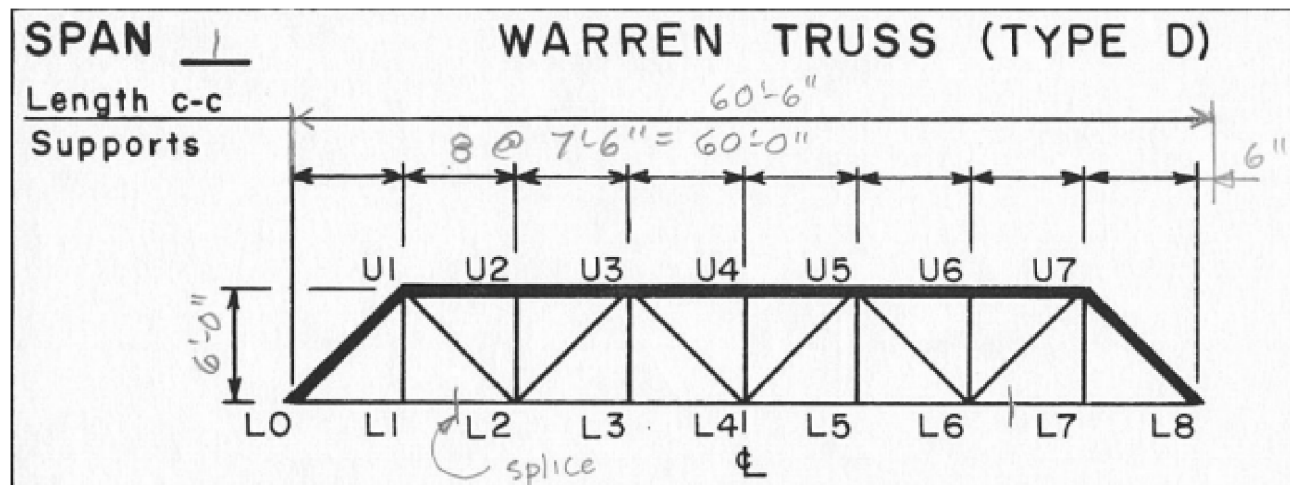
Location to relocate truss  
 2951 CR 382  
 Carlton, TX 76436

CR 392 at Resley Creek

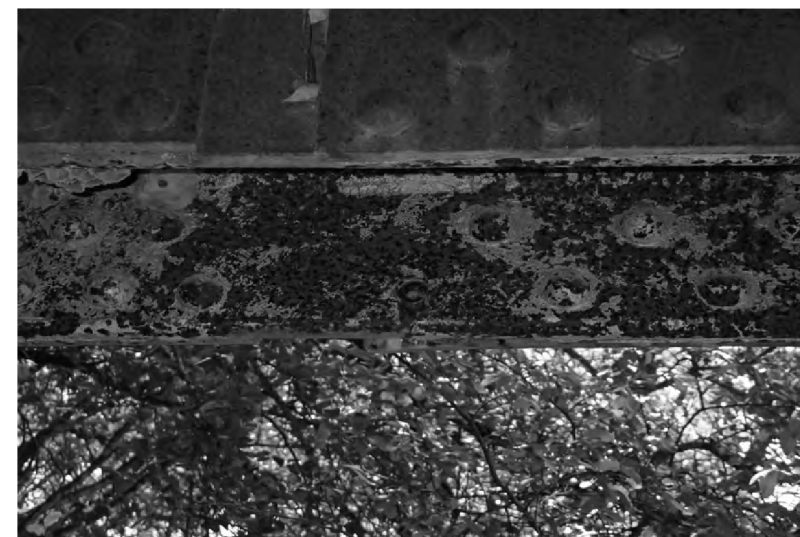
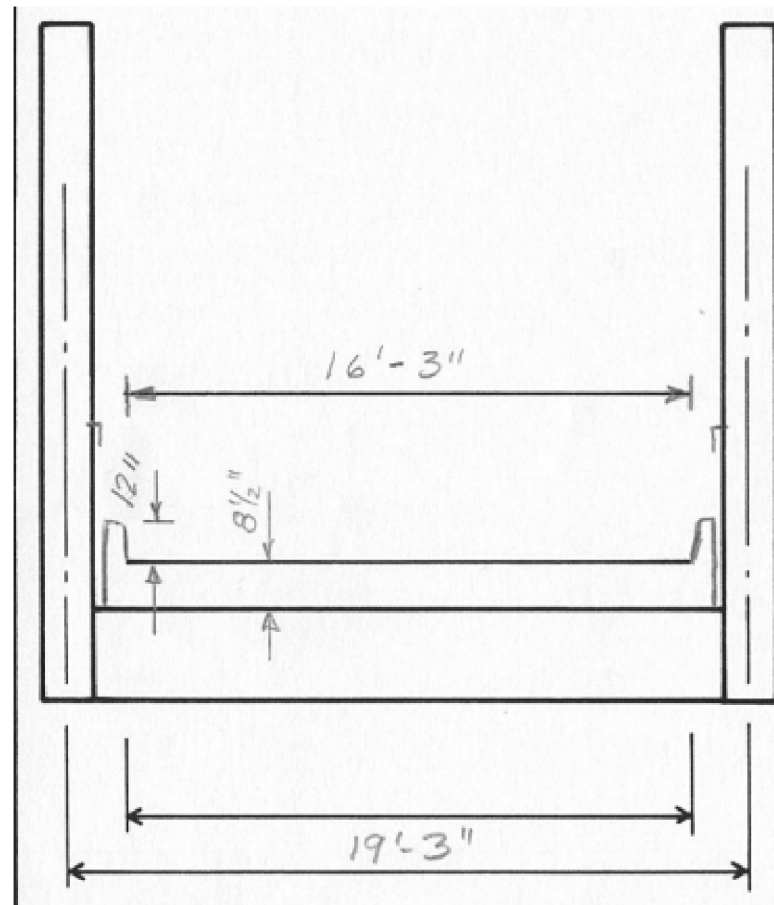
### CR 392 TRUSS RELOCATION



CONT	SECT	JOB	HIGHWAY
0923	17	084	CR 392
DIST		COUNTY	SHEET NO.
BWD		COMANCHE	83



Superstructure View looking South: Lateral bracing bars missing, detached, or sagging. Replace bracing bars is estimated at three. Estimated size is (3/8" X 3" flat strap: 3.825 lbs/ft) X 24'. Dimensions to be field verified.



East Truss L6 Looking East: Missing rivet. Replace rivet.



East Truss L2 Looking North: Missing rivet in bottom row of outboard gusset plate. Replace rivet.

ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
0784	6027	REP STL BRIDGE MEMBER (LATERAL BRACING)	LS	1
0784	6038	REP STL BRIDGE MEMBER (REPL RIVET/BOLT)	EA	2
*	4022	6001 REMOV AND RELOCAT EXISTING TRUSS BRIDGE	LS	0.5

\* Quantity includes removing deck from the truss and lifting and relocating truss to the new location and placing on supports provided by the recipient.

Contractor is required to submit a lifting plan to the Engineer.



*JH Scantling, P.E.*

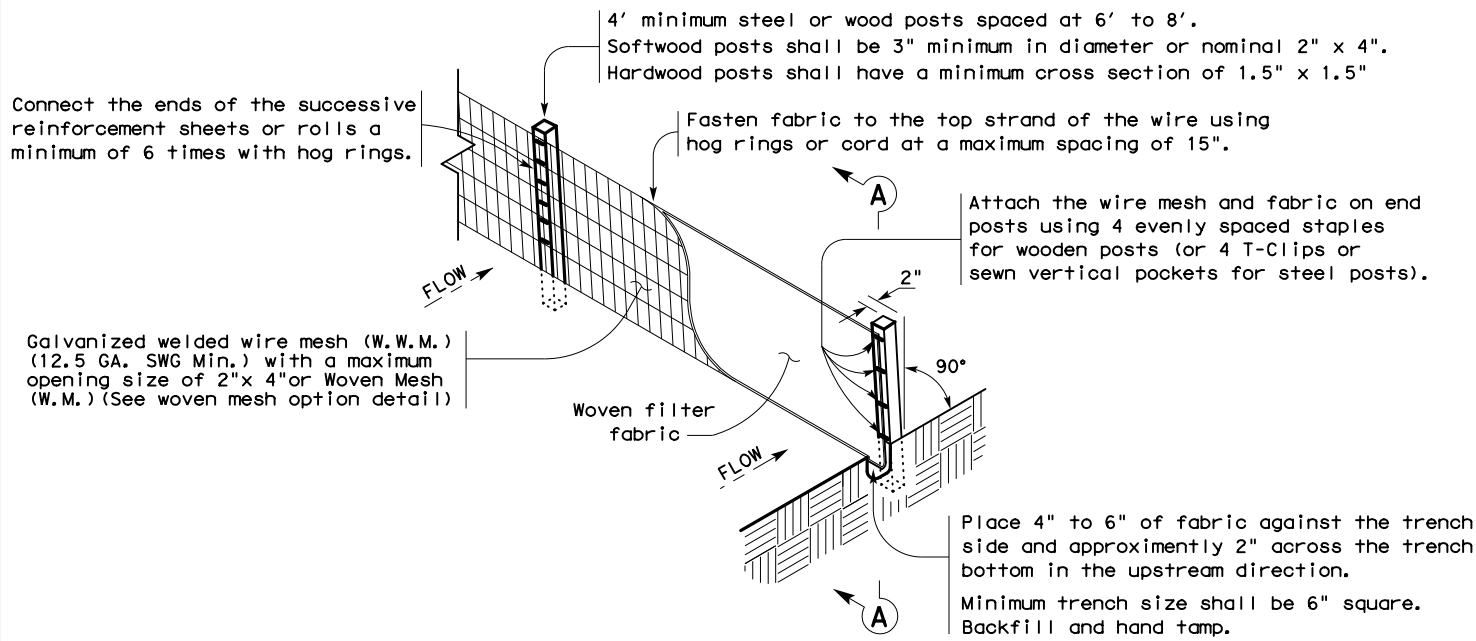
02/01/2024

**CR 392  
TRUSS  
RELOCATION**



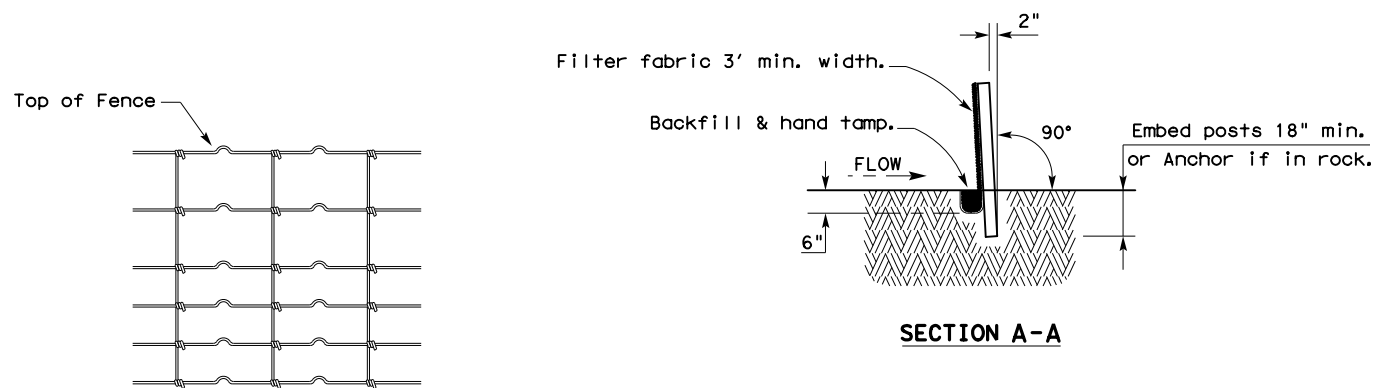
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0923	17	084	CR 392
DIST	COUNTY		SHEET NO.
BWD	COMANCHE		84

10/24/2023  
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 DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.



**TEMPORARY SEDIMENT CONTROL FENCE**

SCF



**HINGE JOINT KNOT WOVEN MESH (OPTION) DETAIL**

Galvanized hinge joint knot woven mesh (12.5 GA. SWG Min.) requires a minimum of five horizontal wires spaced at a maximum of 12 inches apart and all vertical wires spaced at a maximum of 12 inches apart.

**SEDIMENT CONTROL FENCE USAGE GUIDELINES**

A sediment control fence may be constructed near the downstream perimeter of a disturbed area along a contour to intercept sediment from overland runoff. A 2 year storm frequency may be used to calculate the flow rate to be filtered.

Sediment control fence should be sized to filter a maximum flow through rate of 100 GPM/FT<sup>2</sup>. Sediment control fence is not recommended to control erosion from a drainage area larger than 2 acres.

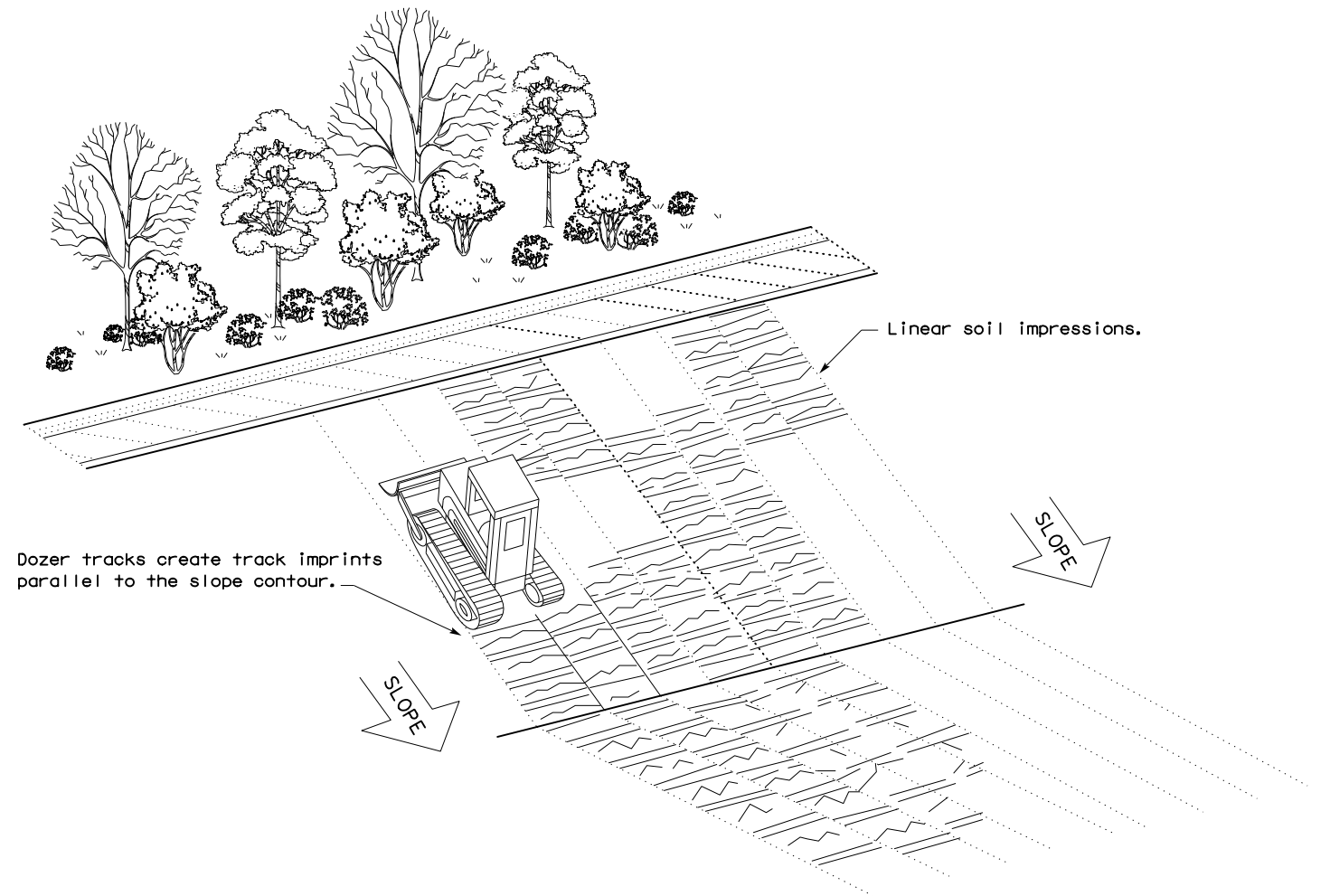
**LEGEND**

Sediment Control Fence

SCF

**GENERAL NOTES**

1. Vertical tracking is required on projects where soil distributing activities have occurred unless otherwise approved.
2. Perform vertical tracking on slopes to temporarily stabilize soil.
3. Provide equipment with a track undercarriage capable of producing linear soil impressions measuring a minimum of 12" in length by 2" to 4" in width by 1/2" to 2" in depth.
4. Do not exceed 12" between track impressions.
5. Install continuous linear track impressions where the minimum 12" length impressions are perpendicular to the slope or direction of water flow.

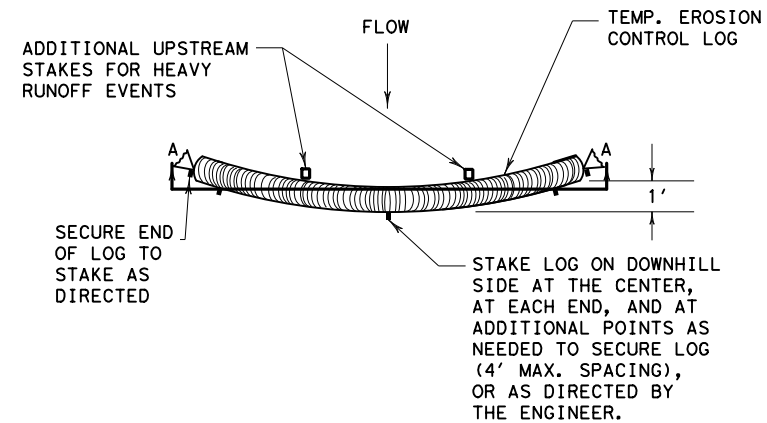


**VERTICAL TRACKING**

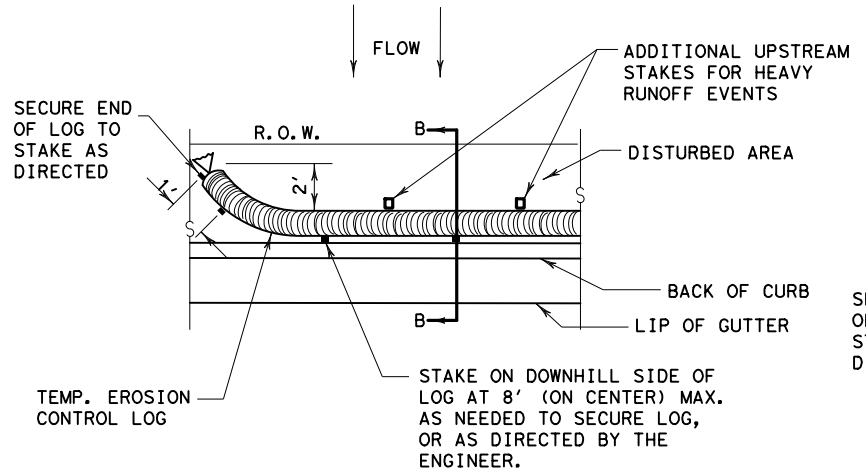
				Design Division Standard	
<b>TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES FENCE &amp; VERTICAL TRACKING</b>					
<b>EC(1)-16</b>					
FILE: ec116	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS	
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0923	17	084	CR 392	
	DIST	COUNTY		SHEET NO.	
	BWD	COMANCHE		85	

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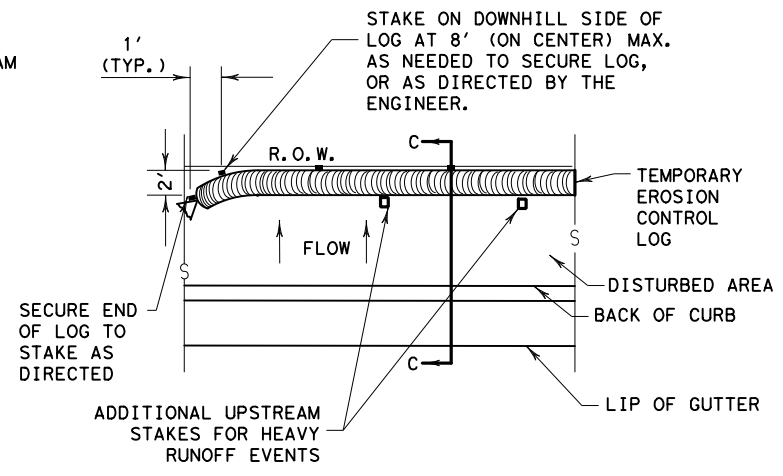
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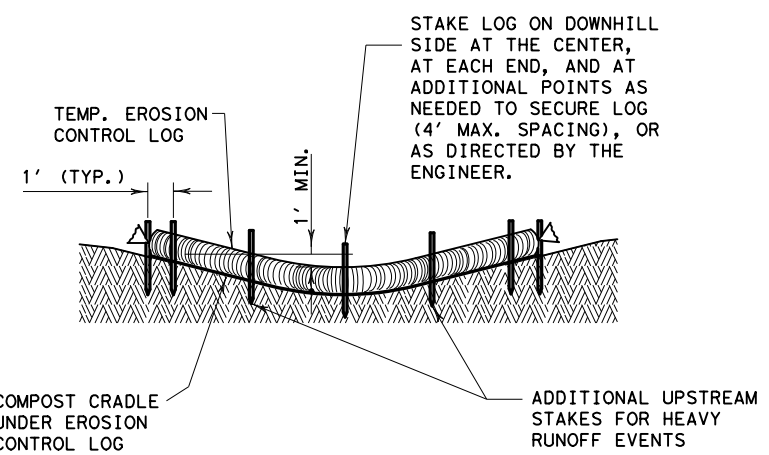
PLAN VIEW



PLAN VIEW



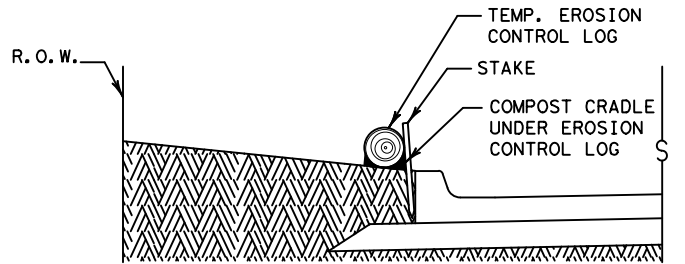
PLAN VIEW



SECTION A-A

EROSION CONTROL LOG DAM

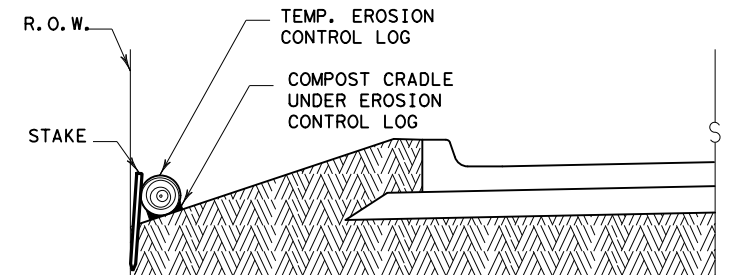
CL-D



SECTION B-B

EROSION CONTROL LOG AT BACK OF CURB

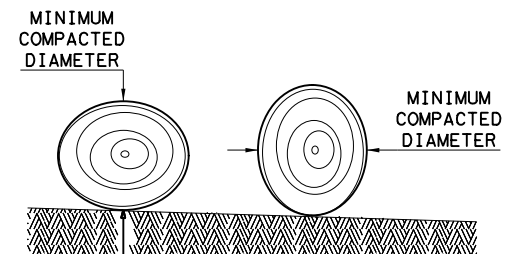
CL-BOC



SECTION C-C

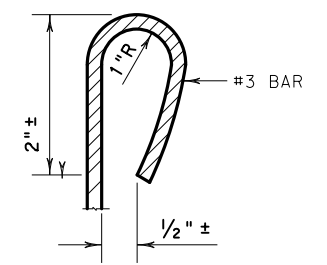
EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY

CL-ROW



DIAMETER MEASUREMENTS OF EROSION CONTROL LOGS SPECIFIED IN PLANS

- LEGEND**
- CL-D EROSION CONTROL LOG DAM
  - CL-BOC EROSION CONTROL LOG AT BACK OF CURB
  - CL-ROW EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY
  - CL-SST EROSION CONTROL LOGS ON SLOPES STAKE AND TRENCHING ANCHORING
  - CL-SSL EROSION CONTROL LOGS ON SLOPES STAKE AND LASHING ANCHORING
  - CL-DI EROSION CONTROL LOG AT DROP INLET
  - CL-CI EROSION CONTROL LOG AT CURB INLET
  - CL-GI EROSION CONTROL LOG AT CURB & GRATE INLET



REBAR STAKE DETAIL

**SEDIMENT BASIN & TRAP USAGE GUIDELINES**

An erosion control log sediment trap may be used to filter sediment out of runoff draining from an unstabilized area.

**Log Traps:** The drainage area for a sediment trap should not exceed 5 acres. The trap capacity should be 1800 CF/Acre (0.5" over the drainage area).

Control logs should be placed in the following locations:

1. Within drainage ditches spaced as needed or min. 500' on center
2. Immediately preceding ditch inlets or drain inlets
3. Just before the drainage enters a water course
4. Just before the drainage leaves the right of way
5. Just before the drainage leaves the construction limits where drainage flows away from the project.

The logs should be cleaned when the sediment has accumulated to a depth of 1/2 the log diameter.

Cleaning and removal of accumulated sediment deposits is incidental and will not be paid for separately.

**GENERAL NOTES:**

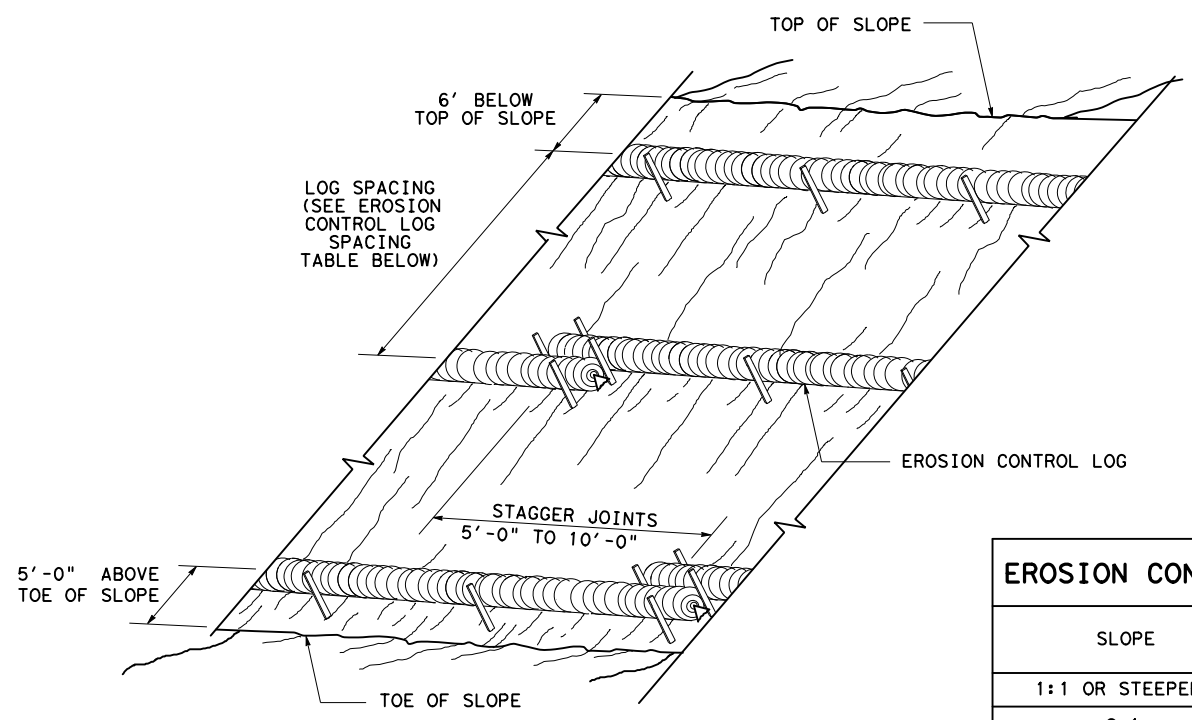
1. EROSION CONTROL LOGS SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS, OR AS DIRECTED BY THE ENGINEER.
2. LENGTHS OF EROSION CONTROL LOGS SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND AS REQUIRED FOR THE PURPOSE INTENDED.
3. UNLESS OTHERWISE DIRECTED, USE BIODEGRADABLE OR PHOTODEGRADABLE CONTAINMENT MESH ONLY WHERE LOG WILL REMAIN IN PLACE AS PART OF A VEGETATIVE SYSTEM. FOR TEMPORARY INSTALLATIONS, USE RECYCLABLE CONTAINMENT MESH.
4. FILL LOGS WITH SUFFICIENT FILTER MATERIAL TO ACHIEVE THE MINIMUM COMPACTED DIAMETER SPECIFIED IN THE PLANS WITHOUT EXCESSIVE DEFORMATION.
5. STAKES SHALL BE 2" X 2" WOOD OR #3 REBAR, 2'-4' LONG, EMBEDDED SUCH THAT 2" PROTRUDES ABOVE LOG, OR AS DIRECTED BY THE ENGINEER.
6. DO NOT PLACE STAKES THROUGH CONTAINMENT MESH.
7. COMPOST CRADLE MATERIAL IS INCIDENTAL & WILL NOT BE PAID FOR SEPARATELY.
8. SANDBAGS USED AS ANCHORS SHALL BE PLACED ON TOP OF LOGS & SHALL BE OF SUFFICIENT SIZE TO HOLD LOGS IN PLACE.
9. TURN THE ENDS OF EACH ROW OF LOGS UPSLOPE TO PREVENT RUNOFF FROM FLOWING AROUND THE LOG.
10. FOR HEAVY RUNOFF EVENTS, ADDITIONAL UPSTREAM STAKES MAY BE NECESSARY TO KEEP LOG FROM FOLDING IN ON ITSELF.

SHEET 1 OF 3

		<i>Design Division Standard</i>	
<b>TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES</b>			
<b>EROSION CONTROL LOG</b>			
<b>EC (9) - 16</b>			
FILE: ec916	DN: TxDOT	CK: KM	DW: LS/PT
© TxDOT: JULY 2016	CONT SECT	JOB	HIGHWAY
REVISIONS	0923 17	084	CR 392
DIST	COUNTY	SHEET NO.	
BWD	COMANCHE	86	

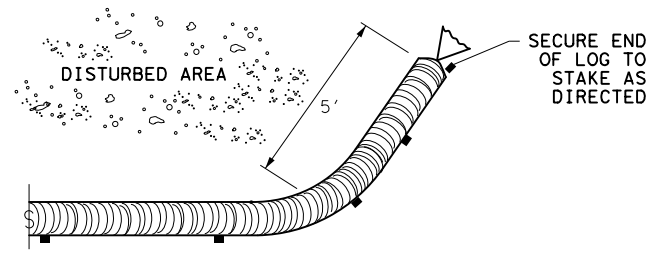
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**EROSION CONTROL LOGS ON SLOPES  
STAKE AND TRENCHING ANCHORING**

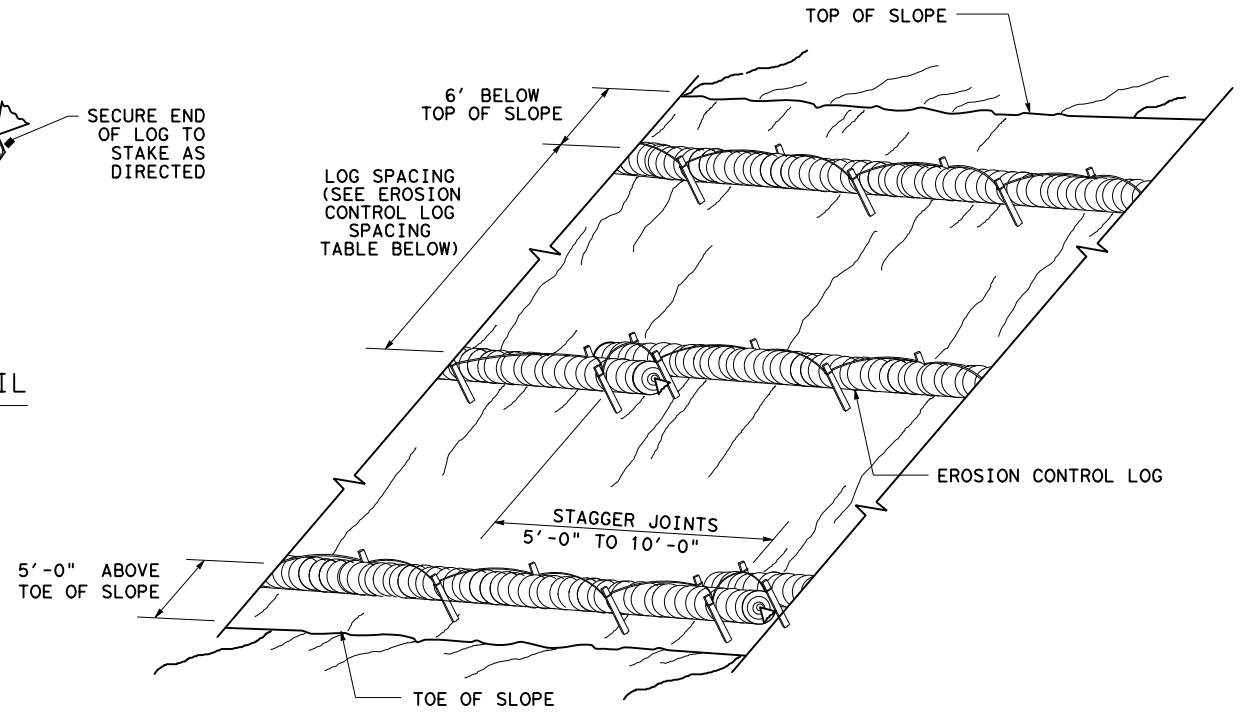
CL-SST



**END SECTION RAP DETAIL**

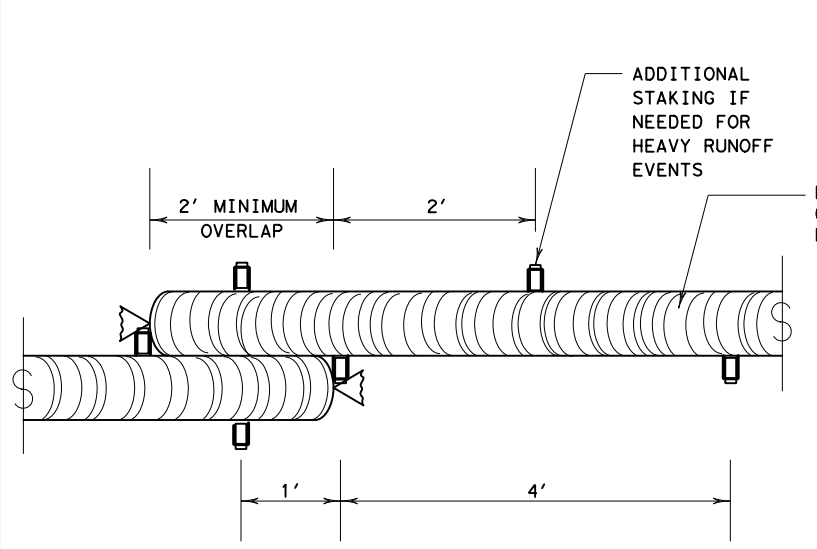
EROSION CONTROL LOG SPACING TABLE				
SLOPE	LOG DIAMETER			
	6"	8"	12"	18"
1:1 OR STEEPER	5'	10'	15'	20'
2:1	10'	20'	30'	40'
3:1	15'	30'	45'	60'
4:1 OR FLATTER	20'	40'	60'	80'

\* ADJUSTMENTS CAN BE MADE FOR SOIL TYPE:  
 SOFT, LOAMY SOILS-ADJUST ROWS CLOSER TOGETHER;  
 HARD, ROCKY SOILS- ADJUST ROWS FARTHER APART



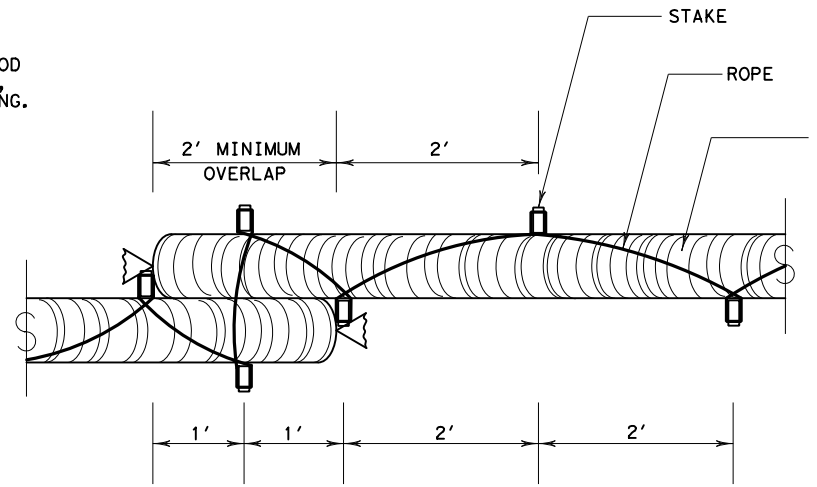
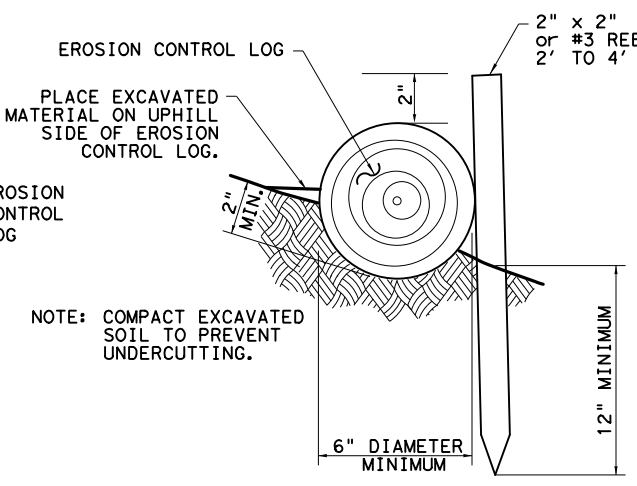
**EROSION CONTROL LOGS ON SLOPES  
STAKE AND LASHING ANCHORING**

CL-SSL



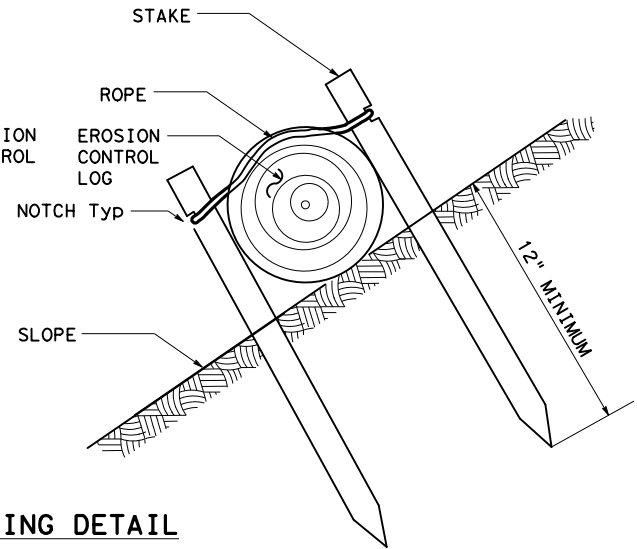
**STAKE AND TRENCHING ANCHORING DETAIL**

CL-SST

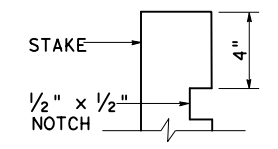


**STAKE AND LASHING ANCHORING DETAIL**

CL-SSL



TRENCH DEPTH TABLE	
LOG DIAMETER	DEPTH
6"	2"
8"	3"
12"	4"
18"	5"

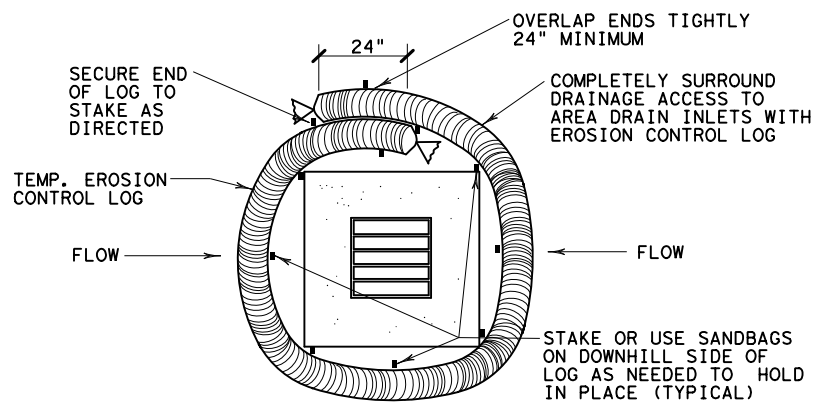


**STAKE NOTCH DETAIL**

SHEET 2 OF 3

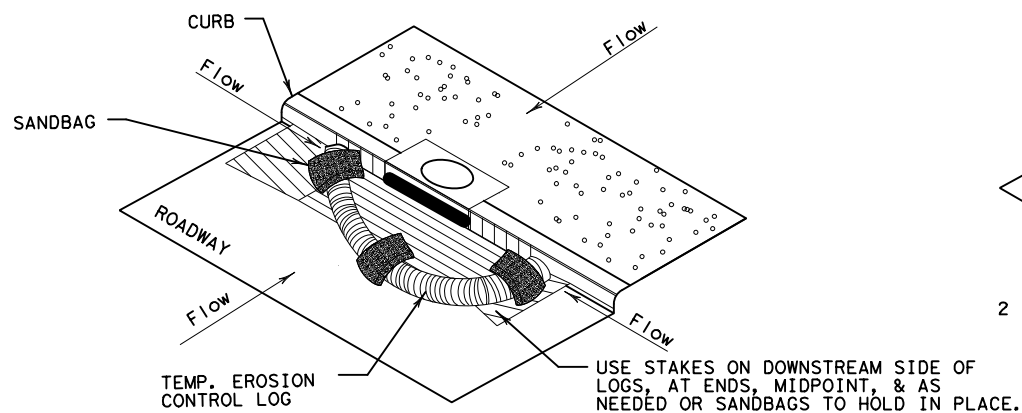
		Design Division Standard	
<b>TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES</b> <b>EROSION CONTROL LOG</b> <b>EC (9) - 16</b>			
FILE: ec116	DN: TxDOT	CK: KM	DW: LS/PT
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REVISIONS	DIST: BWD	COUNTY: COMANCHE	SHEET NO.: 87

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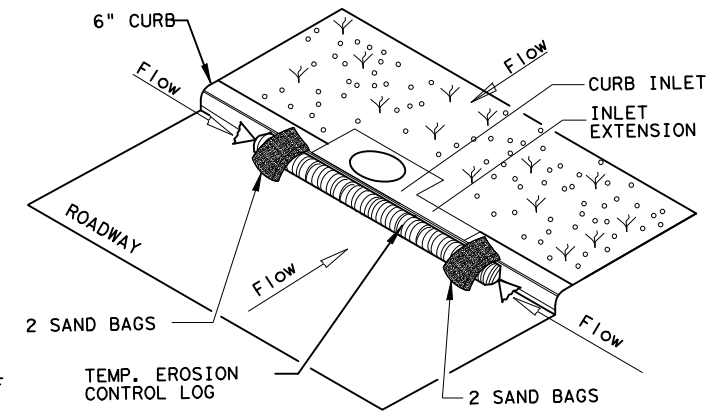
**EROSION CONTROL LOG AT DROP INLET**

CL-DI



**EROSION CONTROL LOG AT CURB INLET**

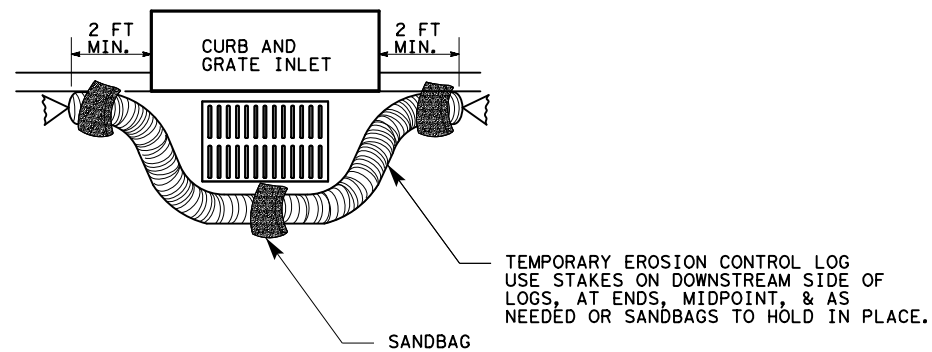
CL-CI



**EROSION CONTROL LOG AT CURB INLET**

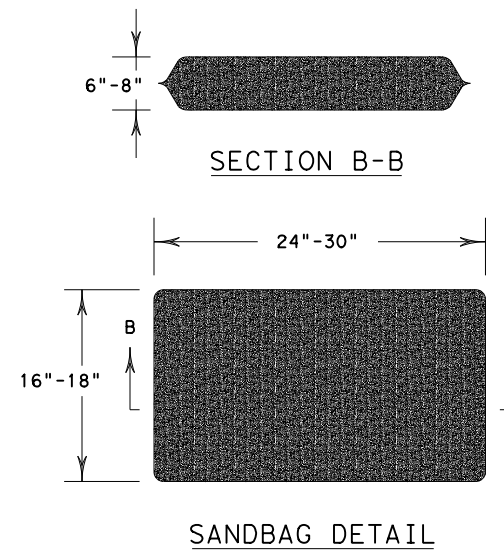
CL-CI

NOTE:  
 EROSION CONTROL LOGS USED AT CURB INLETS SHOULD ONLY BE USED IF THEY WILL NOT IMPEDE TRAFFIC OR FLOOD THE ROADWAY OR WHEN THE STORM SEWER SYSTEM IS NOT FULLY FUNCTIONAL.



**EROSION CONTROL LOG AT CURB & GRADE INLET**

CL-GI



SHEET 3 OF 3

		<i>Design Division Standard</i>	
<b>TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES</b> <b>EROSION CONTROL LOG</b> <b>EC (9) - 16</b>			
FILE: ec916	DN: TxDOT	CK: KM	DW: LS/PT
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			SHEET NO. 88